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(72) Inventor: **Van Reeth, Rudy**  
**2870 Puurs (BE)**

(74) Representative: **Ostyn, Frans et al**  
**K.O.B. NV,**  
**Kennedypark 31 c**  
**8500 Kortrijk (BE)**

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(71) Applicant: **Wienerberger Bricks N.V.**  
**8500 Kortrijk (BE)**

(54) **Method for prefabricating a self-supporting wall element**

(57) The invention relates to a method for prefabricating a self-supporting wall element (1), in which the units (2) of the same and/or of different dimensions and construction are attached to one another, and in which the units are glued together. Preferably, the units are glued together by means of a glue, which may be applied as a mono or a bicomponent, and more preferably

by means of a type of glue based on the water glass principle. Preferably the wall element (1) is provided with a lintel (4) and preferably is attached to the backing construction (7) through a blind anchoring or a visible anchoring system.

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## Description

**[0001]** The invention relates to a method for prefabricating a self-supporting wall element, in which the units of the same and/or of different dimensions and construction are attached to one another.

**[0002]** Up to the present small-scale units, such as bricks, concrete stones, sand-lime bricks and related products were supplied to the building site in bulk and transformed into a wall or similar, and by means of so-called cavity wall ties, the whole is attached to the backing construction.

**[0003]** The disadvantage of a similar method is, that influences of the weather play an important part as the final result of the whole is concerned. Besides, there is shortage of skilled labour, because of which masonry of a poor quality is realized, because of which the result is not very nice from an aesthetic point of view. Further, the costs for realizing such a wall construction are relatively high, because all this has to be carried out manually and what is more, on the building site the necessary scaffolding has to be provided. Further, mutually connecting stones in the present wall constructions occurs by means of a connecting material, for instance, a mixture of cement, lime and sand (mortar), which has a relatively low adhesive power.

**[0004]** The purpose of the invention is to provide a method for prefabricating a self-supporting wall element, in which units of the same and/or of different dimensions and construction are attached to one another, not presenting the above-mentioned disadvantages.

**[0005]** This purpose is attained by providing a method for prefabricating a self-supporting wall element, in which units of the same and/or of different dimensions and construction being attached to one another, in which the units however are glued together.

**[0006]** In a first preferred method according to the invention, the units are glued together by means of a glue, which may be applied as a mono or a bicomponent.

**[0007]** In a more preferred method according to the invention, said glue is a type of glue based on the water glass principle.

**[0008]** In a second preferred method according to the invention, the units are glued together by means of a cement bound glue mortar.

**[0009]** The self-supporting wall element, in a preferred method according to the invention, is provided with a lintel.

**[0010]** The advantage of providing a lintel is, that the self-supporting wall element will be prevented from breaking. Moreover, deflection will be avoided.

**[0011]** In a more specific method according to the invention the lintel is provided with a pre-stressed reinforcement.

**[0012]** Its advantage is that an additional safety and/or possibility for suspension is created.

**[0013]** The lintel may further be provided with mounting means.

**[0014]** More preferably, these mounting means comprise an anchor rail.

**[0015]** This has the advantage that a simple suspension system may be attached to the wall element.

5 **[0016]** In a preferred method according to the invention, the wall element is to be attached to a backing construction.

**[0017]** In doing so, the wall element may be attached to the backing construction on the one hand by means of a blind anchoring construction.

10 **[0018]** With said blind anchoring the wall element is preferably provided with a lintel, in which the lintel is provided with mounting means for mounting the self-supporting wall element to the backing construction.

15 **[0019]** Preferably, said mounting means comprise an anchor rail.

**[0020]** On the other hand the wall element may be attached to the backing construction by a visible anchoring system.

20 **[0021]** Preferably, said visible anchoring system is provided with a bracket comprising a dowel.

**[0022]** On the one hand, this wall element may be provided with one or several anchor stones, provided with a slot-shaped hole for applying said dowel.

25 **[0023]** On the other hand, the wall element may be provided with a lintel, which is provided with a slot-shaped hole for applying said dowel.

**[0024]** In a preferred method according to the invention, said self-supporting wall element is a self-supporting fully ceramic wall element.

30 **[0025]** In a preferred method according to the invention, a safety reinforcement is applied to the back of the wall element.

35 **[0026]** Preferably, this safety reinforcement is carried out in the shape of a net.

**[0027]** Preferably, the method according to the invention is applied with outside house front elements.

40 **[0028]** To further clarify the characteristics of the present invention, and in order to indicate its additional advantages and particulars, a more detailed description will follow of the prefabricated self-supporting wall elements produced according to a method according to the invention and the parts being used to that purpose.

45 It should be obvious that nothing of the following description may be interpreted as a restriction of the protection expressed in the claims of the method according to the invention.

**[0029]** In this description, by means of reference numbers, reference is made to the attached drawings, of which:

- figure 1 is a perspective view of a prefabricated self-supporting wall element according to the invention without a lintel;
- 55 - figure 2 is a perspective view of a prefabricated self-supporting wall element according to the invention provided with a lintel;
- figure 3 is a cross-section of a prefabricated self-

supporting wall element according to the invention provided with a lintel and which is attached to a backing construction by means of a blind anchoring;

- figure 4 is a cross-section of a prefabricated self-supporting wall element according to the invention without a lintel and which is attached to a backing construction by means of a visible anchoring system;
- figure 5 is a perspective view of a bracket which is a part of the visible anchoring system and which is provided with a dowel;
- figure 6 is a perspective view of a wind tie, which has been applied to a plate which extends over to building units;
- figure 7 is a front view of a prefabricated self-supporting wall element as represented in figure 4.

**[0030]** In the method according to the invention for prefabricating self-supporting wall elements (1) as shown in figures 1 and 2, units (2), for instance bricks, having the same and/or different dimensions and construction are mutually formed into a prefabricated self-supporting wall element (1). By self-supporting is meant, that no additional construction is required to obtain a supporting entity. This may be carried out by gluing together these units (2) by means of glue joints (3) which are carried out, for instance, as edge or butt joints or a combination of both. The glue joints (3) with a dimension of 1 to 8 mm are applied in conditioned surroundings. By applying glue joints (3) in conditioned surroundings the sensitivity to deflection is almost nil. Because of the small dimensions of the glue joints (3) the prefabricated self-supporting wall element (1) will show the real colour of the units (2), because of which a nice final product is obtained from an aesthetic point of view.

Moreover, these units (3) may be attached to one another, for instance, by applying glue between the units (3) from behind.

**[0031]** The units (2) which are part of the wall element (1) are mutually connected by a glue which may be applied in a mono or in a bicomponent method and which may belong to the groups of epoxy glues, acrylic glues, polyurethane glues or types of glue based on the water glass principle. These glues may be prepared in almost every colour.

When using a bicomponent glue the disadvantage of the spraying devices known for gluing units (2) is that the glue will harden in the spraying device, because of which it can no longer be used. For that purpose a spraying device exists in which the two components will stay separated until they have left the nozzle of the spray gun.

**[0032]** In addition to all chemical synthetic materials (glues) a cement bound glue mortar may be used to interconnect the units (2). Here also it is possible to use edge joints or butt joints or a combination of the two as glue joints (3). Here also, the thickness of the glue layer will be between 1 and 8 mm. This glue also is available

in almost every colour.

All said types of glue have an adhesive strength, which is many times as high as the traditional mortar consisting of glue, lime and sand.

**[0033]** The units (3) mutually glued together may be provided with additional constructive provisions such as edge joint reinforcements and lintel constructions.

The self-supporting capacity and the constructive characteristics may be improved by applying an edge joint reinforcement.

Besides using only a glue joint (3), the constructive possibilities of the self-supporting wall element (1) may be extended by carrying out the wall element (1) with a lintel (4), as represented in figure 2. The lintel (4) may be provided with a reinforcement (5), whether pre-stressed or not, such as represented in figure 3, because of which an additional safety and/or possibility for attaching is created. In order to provide a pre-stressed reinforcement (5) in the lintel (4) a ceramic U-section, together with a steel reinforcement (5) is put under strain, by exerting tensile forces on the entity, after which it is completely filled up with concrete, which will set. In such a manner a reinforcement (5) is obtained which is subjected to tensile forces.

The lintel (4) may also be provided with mounting means, preferably comprising an anchor rail (6) as represented in figure 3, offering the possibility to attach a simple suspension system to the wall element (1).

In specific applications, the lintel (4) may also act as a support, when the wall elements (1) will exceed the dimensions where the self-supporting capacity of the wall element (1) will reach its limits.

**[0034]** A further advantage of the lintel (4) is that the building time is substantially shortened by applying the method according to the invention by a speedy installation compared to traditionally applying (small-scale) units. As the occasion arises, costs may be saved because no expenses for scaffolding or for the use of an alternative scaffolding method are required.

**[0035]** Further, a safety reinforcement may be applied to the back of the wall element (1) (not represented in the figures). This safety reinforcement consists of a kind of a net, glued to the back of the wall element (1). This net may be made both of synthetic material or of non-corroding steel. This safety reinforcement also gives protection to the wall element (1) during transport.

**[0036]** The wall element (1) may be attached to a backing construction (7) as represented in figures 3 and 4. The self-supporting wall elements (1) are connected to the backing construction by means of brackets (8)/ anchor provisions (16) and wind ties (9) (see figure 6). On the building site, the wall element (1) may be attached to the backing construction (7) in various manners. The wall element (1) may be attached to the backing construction (7) through a visible anchoring system, as represented in figure 3. The wall element (1) being placed on brackets (8a) which have been provided with a dowel (10), as represented in figure 5. By this dowel

(10) an upright catch is meant which is installed on the bracket (8a), the purpose of which is to prevent the wall element (1) from sliding off the bracket (8a) and at the same time, to secure the wall element (1) from the pressure and the pull caused by the wind. As represented in figure 4, the wall element (1) is connected to the backing construction (7) by means of this dowel (10). For that purpose, anchor stones (11), i.e. suitable units (2), have to be incorporated in the wall element (1). The number of anchor stones (11) depending on the width of the wall element (1). The anchor stones (11) are provided with a slot-shaped hole (12) in which the dowel can be lodged. Moreover, the self-supporting wall element (1) may be provided with a lintel (4) in which a slot-shaped hole (12) is provided in which the dowel (10) may be lodged, and which is not represented in the figure. The slot-shaped hole being a few millimetres larger than the size of the dowel (10). The oversize of the slot-shaped hole (12) with respect to the dowel (10) will facilitate installation. The bottom of the anchor stones (11) or of the lintel (4) (likewise called slot-shaped hole side) is provided with set (shaped) plate material (13) of corrosion resistant steel or synthetic material, which is to prevent the wall element (1) and the slot-shaped hole (12) provided in the anchor stone (11) from being damaged. This shaped plate material (13) can be attached to the wall element (1) both by gluing and by mechanical means. The brackets (8a), as represented in figure 5, are angle irons of a restricted width, which are provided with the dowel (11). These brackets (8a) are adjustable in both the horizontal and the vertical direction.

**[0037]** Another manner to attach the wall element (1) to the backing construction (7) is a blind anchoring, making use of a lintel construction (4) and the bracket (8a) not being visible directly, as represented in figure 3.

**[0038]** With this application, the bottom of the wall element (1) is provided with a lintel (4), for instance, a brick and concrete lintel, whether being provided with a prestressed reinforcement (3) or not. The lintel (4) being provided with mounting means, which preferably comprise an anchor rail (6) and which may already be incorporated during the production of the lintel (4). If a prestressed lintel (4) is chosen, this anchor rail (6) may be attached or hooked on to the lintel by means of a special hook and thereafter being filled up with concrete.

As shown in figure 3, the wall element (1), together with the lintel (4), is attached to the backing construction (7) by means of an anchoring provision (16). This anchoring provision (16) consists, for instance, of two angle irons (14, 15). A first angle iron (14) being provided, which is attached to the anchor rail (6) in the brick and concrete lintel (4) and which has an upright threaded rod. This first angle iron (14) is provided with a vertical slot-shaped hole, which is provided with a knurling (not represented in the figure) in order to be able to adjust the wall element (1) in the vertical direction.

**[0039]** A second angle iron (15) is connected to the backing construction (7) by means of a mechanical or

chemical anchoring. On the horizontal part of this second angle iron (15) sleeves (nuts) (17) are applied, a slot-shaped hole provided with a knurling (not represented in the figure) being provided in the longitudinal direction between these sleeves (17). By means of this slot-shaped hole the first (14) and the second angle iron (15) are finally connected to one another. Possible tolerances of the backing construction (7) may be absorbed by this slot-shaped hole. Further, two slot holes to be provided with a knurling (not represented in the figure) are provided in the vertical part of the second angle iron (15). By means of a bolt or a threaded rod, this second angle iron (15) may be attached to the backing construction (7). The slot-shaped holes with knurling allowing an adjustment in height of the wall element (1).

**[0040]** When using a lintel (4), the wall element (1) has a number of uses. The brick and concrete lintel with anchor rail (6) may be one of the possibilities to attach a blind suspension. If necessary, the lintels (4) may be applied at random to any place of the wall element (1) (not represented in the figures).

**[0041]** At the top, both with the blind anchoring and the visible anchoring system, wind ties (9) are applied (as represented in figure 6) in order to transfer any pressure and/or pulling forces caused by wind to the backing construction (7). These so-called wind ties are applied to prevent the wall element (1) from being moved under the influence of the pressure or the pulling forces caused by the wind. These wind ties (9) consist of an angle strip (18), which is provided with two slot-shaped holes (19, 20) with knurling, one in the horizontal direction, one in the vertical direction. This angle strip is attached to the wall element (1) by means of an anchor plate (21) extending over two units (2). This anchor plate (21) extends over two units (2) in order to obtain a better distribution of the load.

The attachment to the backing construction (7) may occur both by means of mechanical and chemical anchoring. The slot-shaped holes (19,20) with knurling will offer the possibility to allow an adjustment in both a horizontal and a vertical direction to be realized.

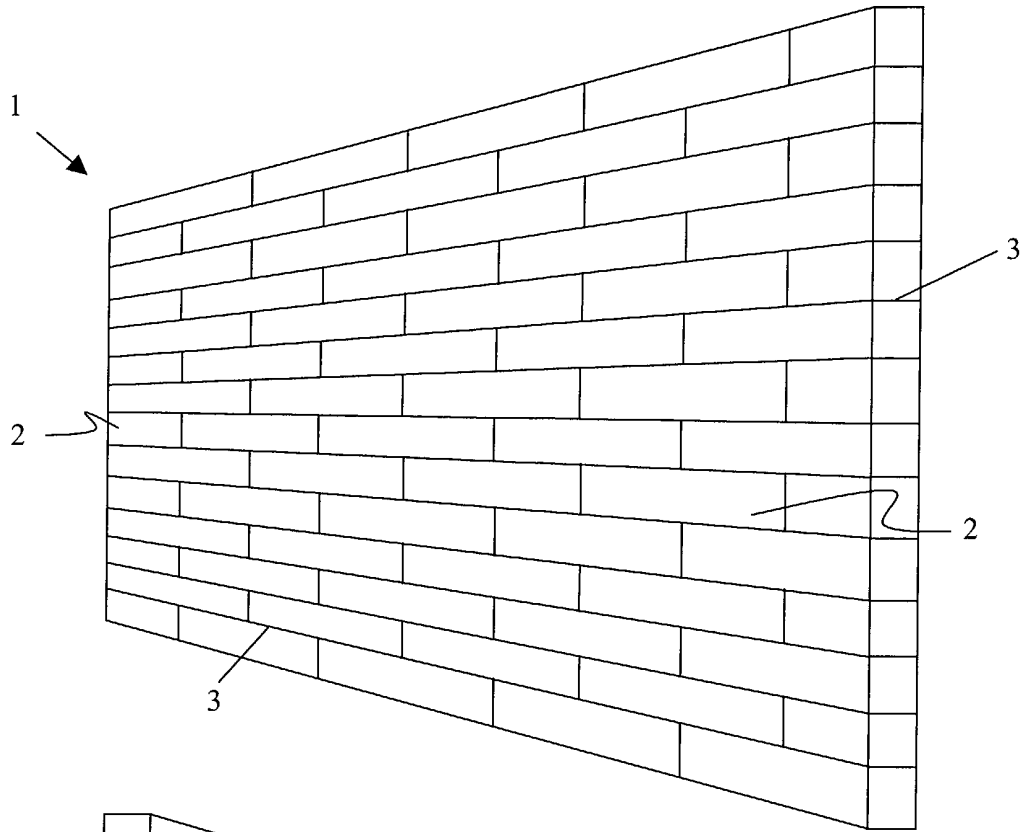
**[0042]** The method according to the invention is particularly suitable for small-scale elements, more particularly for gluing together bricks. Preferably the self-supporting prefabricated wall element (1) is fully ceramic.

**[0043]** The method according to the invention is especially applied to outside house front elements, which does not alter the fact that this method may be applied to inside wall elements for inside walls as well.

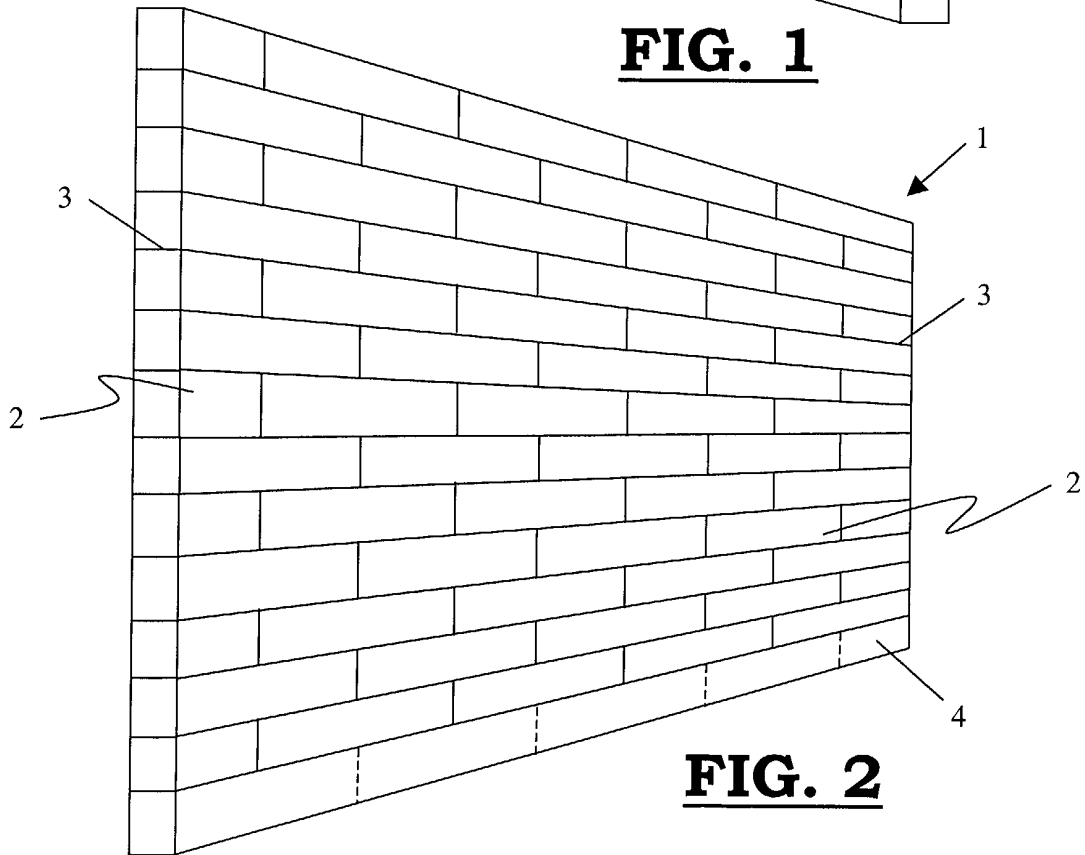
## Claims

1. Method for prefabricating a self-supporting wall element (1), in which units (2) of the same and/or of different dimensions and construction are attached to one another, **characterized in that** the units (2) are glued together.

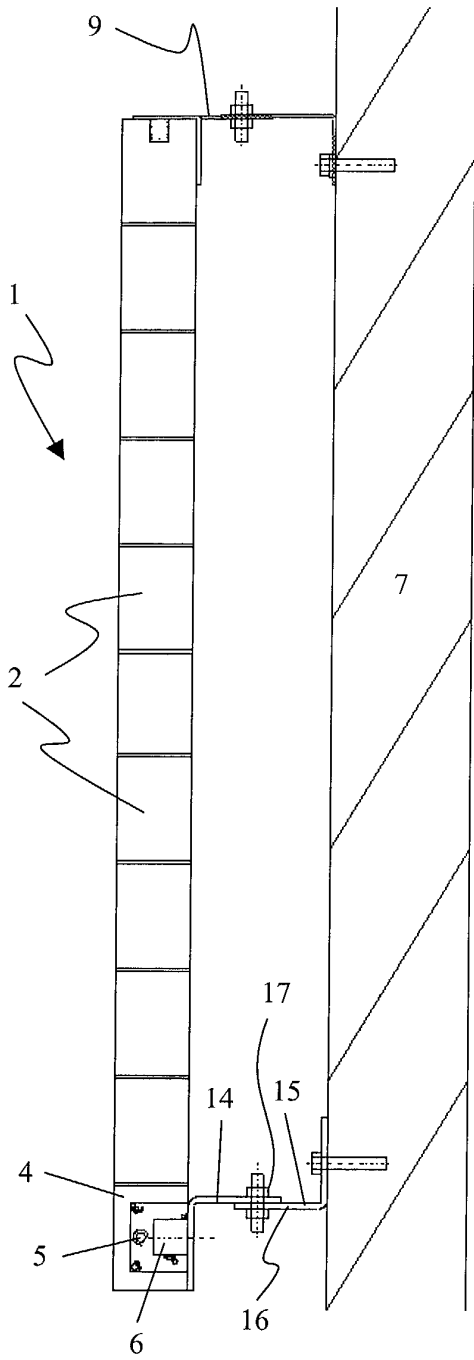
2. Method according to claim 1, **characterized in that** the units (2) are glued together by means of a glue, which may be applied as a mono or in a bicomponent.
3. Method according to claim 2, **characterized in that** said glue is a type of glue based on the water glass principle.
4. Method according to claim 1, **characterized in that** the units (2) are glued together by means of a cement bound glue mortar.
5. Method according to any one of the claims 1 up to and including 4, **characterized in that** the self-supporting wall element (1) is provided with a lintel (4).
6. Method according to claim 5, **characterized in that** the lintel (4) is provided with a pre-stressed reinforcement (5).
7. Method according to claim 5 or 6, **characterized in that** the lintel (4) is provided with mounting means.
8. Method according to claim 7, **characterized in that** said mounting means comprise an anchor rail (6).
9. Method according to any one of the claims 1 up to and including 8, **characterized in that** the self-supporting wall element (1) is attached to a backing construction (7).
10. Method according to claim 9, **characterized in that** the wall element (1) is attached to the backing construction (7) by means of a blind anchoring.
11. Method according to claim 10, **characterized in that** with said blind anchoring the wall element (1) is provided with a lintel (4), in which the lintel (4) is provided with mounting means for mounting the self-supporting wall element (1) to the backing construction (7).
12. Method according to claim 11, **characterized in that** said mounting means comprise an anchor rail (6).
13. Method according to claim 9, **characterized in that** the wall element (1) is attached to the backing construction (7) by means of a visible anchoring system.
14. Method according to claim 13, **characterized in that** said visible anchoring system is provided with a bracket (8) comprising a dowel (10).
15. Method according to claim 14, **characterized in that** the wall element (1) is provided with one or more anchor stones (11) which are provided with a slot-shaped hole (12) for applying said dowel (10).
16. Method according to claim 14, **characterized in that** the wall element (1) is provided with a lintel (4) which is provided with a slot-shaped hole (12) for applying said dowel (10).
17. Method according to any one of the claims 1 up to and including 16, **characterized in that** said self-supporting wall element (1) is a self-supporting fully ceramic wall element (1).
18. Method according to any one of the preceding claims, **characterized in that** a safety reinforcement is applied to the back of the wall element (1).
19. Method according to claim 18, **characterized in that** said safety reinforcement is carried out in the shape of a net.
20. Method according to any one of the preceding claims, **characterized in that** the same is applied to outside house front elements.



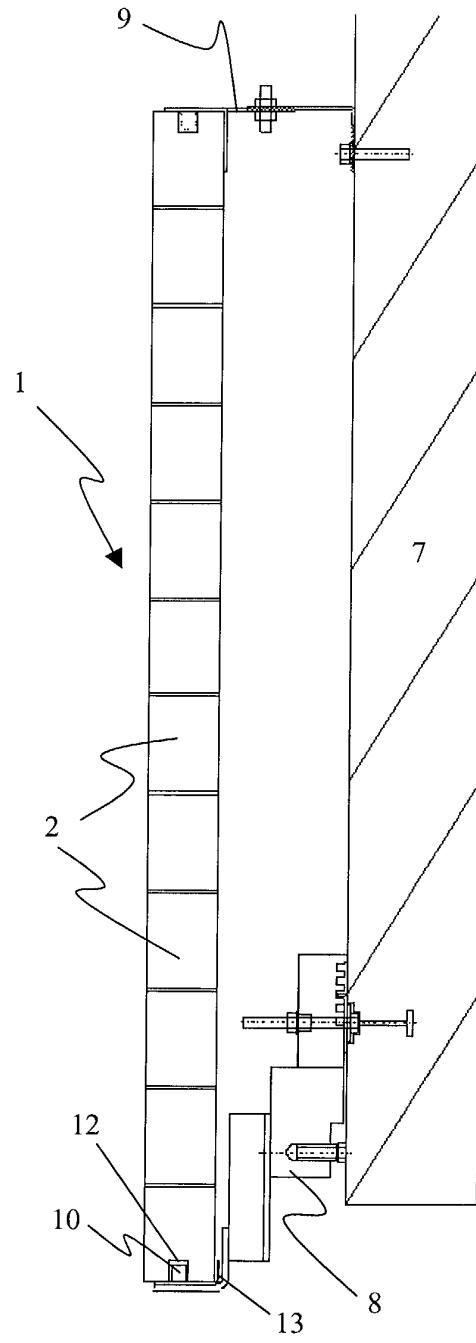
**FIG. 1**



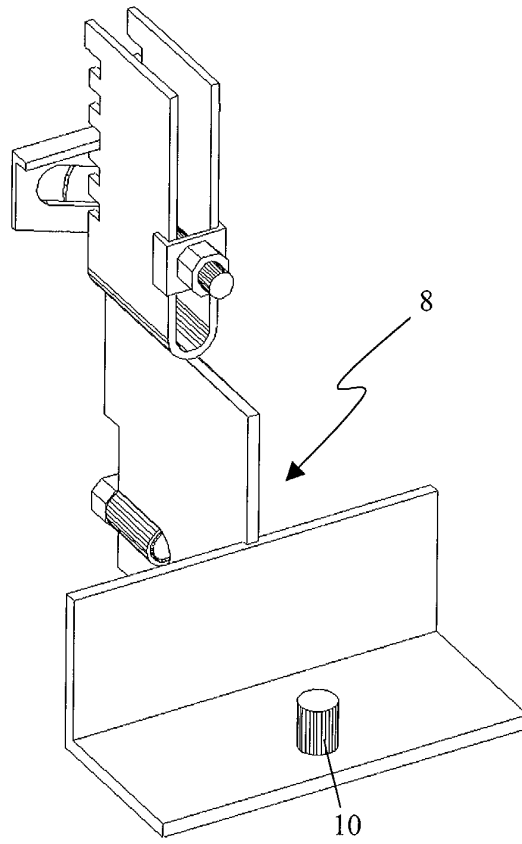
**FIG. 2**



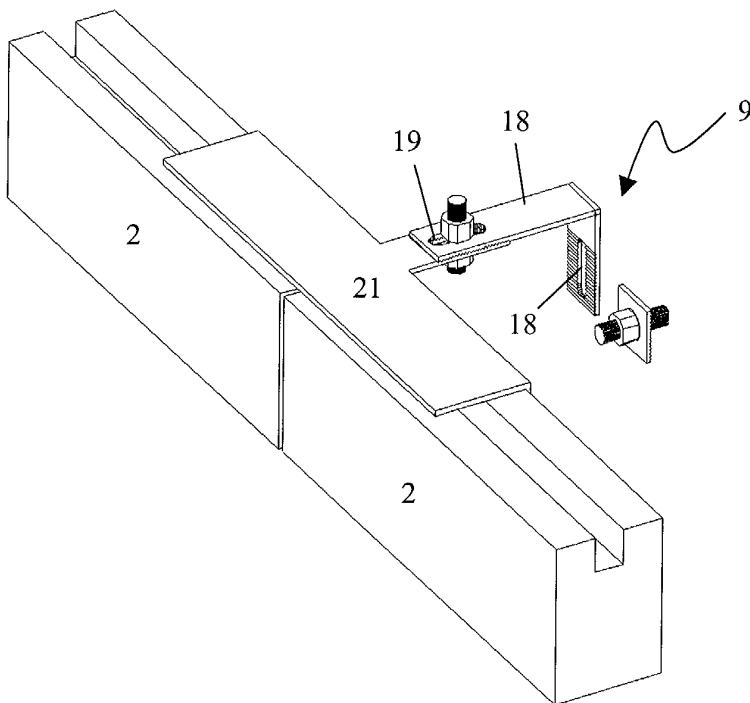
**FIG. 3**



**FIG. 4**

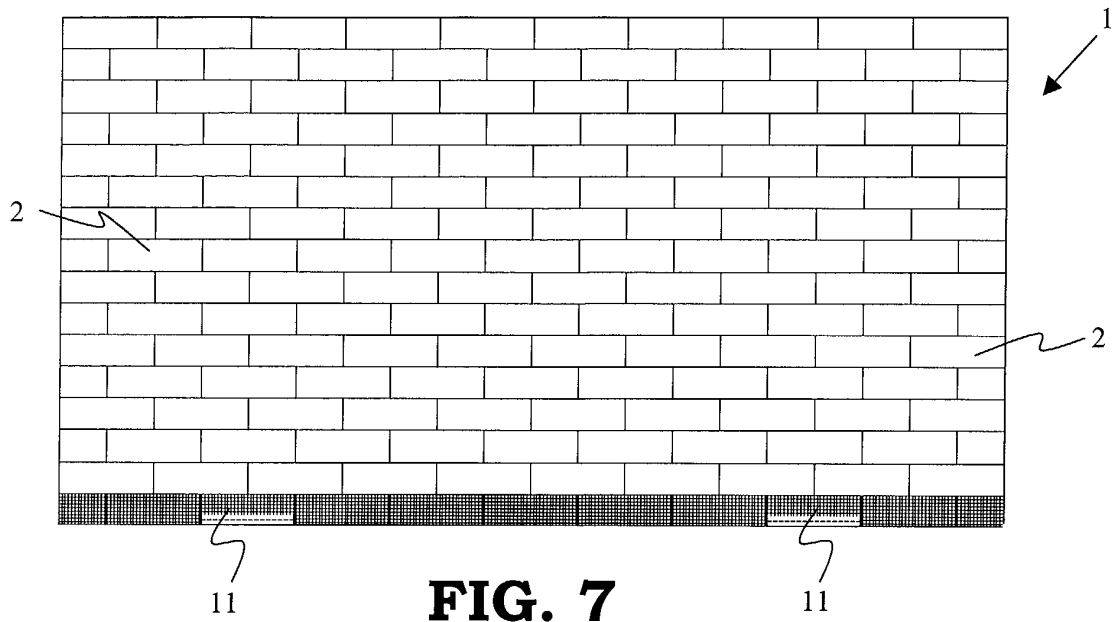


**FIG. 5**



**FIG. 6**







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EUROPEAN SEARCH REPORT

Application Number  
EP 03 07 6101

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A	DE 197 48 452 A (GEYER) 6 May 1999 (1999-05-06) * column 3, line 24 - line 32 *	18,19	
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			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
			E04C E04F
The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
THE HAGUE		10 July 2003	Mysliwetz, W
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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	

EPO FORM 1503 03/82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT  
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EP 03 07 6101

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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10-07-2003

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