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(54) **FASTENING ELEMENT FOR USE IN A BUILDING SYSTEM FOR BUILDING A WALL IN MASONRY STONES**

(57) Fastening element suitable for use in a building system for building a wall (5) in masonry stone (7), whereby one departs from prefab building elements (4) consisting of layers (6) of masonry stones (7), whereby in an outer layer (6) of masonry stones (7) a groove (15) is applied in the longitudinal direction of the masonry stones (7), whereby on the other outer layer (6) of masonry stones a joining element (14) is applied with an upward facing edge (16) and whereby the wall (5) is built with these prefab building elements (4) by fitting the groove (15) and the upward edge (16) of prefab building elements (4) lying on top of each other, into each other whereby the fastening element (21) is in the form of a mainly L-shaped profile (22) and a cooperating pin (23), whereby one leg of the L-shaped profile (22) can be fixed on a building element (4) and of which the other leg has a feed-through hole (25) for the pin (23) for attaching the fastening element (21) to an interior wall (20) and in that the pin (23) has means (26) to be able to fix the pin (23) with respect to the L-shaped profile (22) and in that the above-mentioned means (26) consist of an adjusting screw (27) applied fixed on the pin (23) and a clamping screw (28) rotatably applied on the pin (23) and a washer (29) applied loose against a stopper (35) fixed on the pin (23), whereby the adjusting screw (27) and the clamping

screw (28) fit through the above-mentioned feed-through hole (25) and the washer (29) does not and whereby the L-shaped profile (22) can be clamped between the clamping screw (28) and the stopper (35) on the pin (23) .

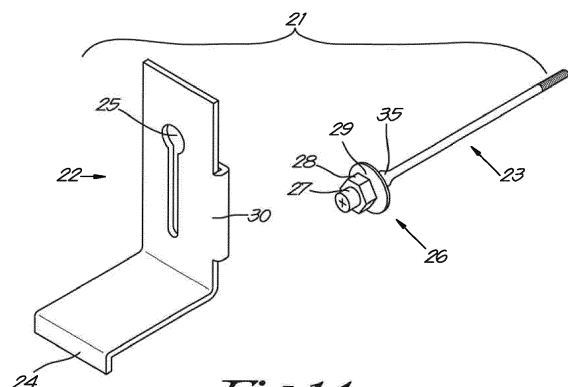


Fig. 14

Description

[0001] The present invention relates to a fastening element suitable for use in a building system for building a wall in masonry stones.

[0002] Here masonry stones are block-shaped elements with which a wall can be built. These masonry stones can be made of baked brick, natural stone, concrete, wood, synthetics, metal or any other material with which a wall can be built.

[0003] It is known that traditional outside walls are built with baked bricks or other masonry stones that are laid or adhered next to and upon each other brick by brick and layer after layer, taking account of openings for doors and windows according to the plan.

[0004] A disadvantage of this known method is that it is laborious and requires bricklayers who have a minimum number of years of experience to produce good brickwork that has a uniform appearance without zones with masonry stones with a certain colour nuance being more concentrated than in other zones, so unattractive stains originate with a conspicuously different appearance and without the joints unintentionally meeting in such a way that they have the appearance of joint cracks or are proportionally much too wide.

[0005] A problem is often that good bricklayers are difficult to find so one is compelled to use less experienced people with a less good finish than required sometimes as a result.

[0006] Building an outside wall also takes relatively much time and many working hours.

[0007] Moreover, it is known that bricklayers do not always closely follow the measurements on the building plan and that the place and dimensions of the openings where windows and doors must come are sometimes a number of centimetres away from how shown on the plan.

[0008] That means that windows, doors and sills have to be made to size and can only be ordered after the outside wall has been bricked and one has taken the measurements of the abovementioned openings. This results in a delay in the construction work and a longer time needed to finish a building.

[0009] US 2007/151190 discloses a fastening element according to the preamble of claim 1.

[0010] BE 544 216 A discloses a building system as described in the preamble of claim 1.

[0011] The purpose of the present invention is to provide a solution to the abovementioned and other disadvantages.

[0012] To this end, the invention concerns a fastening element for use in a building system for building a wall in masonry stones, starting with prefab building elements consisting of two or more layers of masonry stones joined, bricked, adhered or suchlike to each other, whereby the building elements have a stepped form on at least one side such that the building elements fit sideways with their stepped side against each other and on each other and can be handled and laid by one person or by two

persons, and whereby in an outer layer of masonry stones a groove is applied in the longitudinal direction of the masonry stones, whereby on the other outer layer of masonry stones a joining element is applied with upward facing edges whereby the outside wall is built with these
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prefab building elements by fitting the groove and the upward edge of prefab building elements lying on top of each other into each other without cement, adhesives or suchlike being used on the construction site.

[0013] An advantage of such a building system is that with such prefab building elements building a wall progresses much faster than with the traditional building system.

[0014] Surprisingly enough, laying such building elements, even with the heaviest building elements of for example 20 kilogram for one person or 40 kilogram for two persons, is just as easy as building brick per brick, particularly because the building elements lie on top of each other with their stepped sides whereby by making use of the joining element, the building elements are automatically well aligned with each other.

[0015] Because the building element has a larger surface than one single masonry stone and because the building elements are automatically aligned so to speak
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by making use of the joining element, it is easier to make them perfectly level and vertically align them.

[0016] In addition, the prefab building elements can be made beforehand at the factory in better humidity and temperature conditions and in the bond required, starting with a stock of masonry stones that is better mixed than what is possible on the site, so the origination of undesired stains is excluded. The origination of imaginary joint cracks can also be avoided in this way as the brickwork bond of the building elements is set beforehand.

[0017] This means that less experienced people can be used on the site to build the wall with such prefab building elements.

[0018] Another important additional advantage is that the outside wall can be built without the need for mortar, adhesive or suchlike to join the prefab building elements to each other.

[0019] On the construction site an overlying prefab building element is simply placed with its groove over the upward facing edge of the joining element of an underlying building element, or the upward facing edge of the joining element of an overlying building element is simply placed in the groove of an underlying building element.

[0020] The building system preferably uses a limited number of types of building blocks, including one or several of the following types or a combination thereof:

- flat building elements to form a straight wall or a gable with on both sides a stepped form by the layers being shifted sideways with respect to each other, whereby the stepped form can depending on requirements be either negative or positive, straight or a combination thereof;
- flat building elements to form a door or window open-

ing, with on one side a stepped form and on the other side an unstepped straight form to form the reveal of the opening whereby the stepped side can be either positive, negative or straight or a combination thereof;

- angled building elements to build an outside wall corner, whereby the sides on one or both sides have a stepped form, whereby the stepped form can depending on requirements be either negative or positive, straight or a combination thereof;

[0021] For the angled building element, this corner element starts with the selected brick bond that determines the brickwork bond of the adjacent building elements.

[0022] The limited choice of building elements has the advantage that fewer kinds of building elements have to be manufactured and stored, and that if the building elements are machine-made, production can take place with more flexibility because the production line has to be converted less often.

[0023] Preferably, based on the architect's plan a building plan is created beforehand on which the required building elements have been drawn with the separate types shown by colour, numbering or suchlike.

[0024] This eases the work of the bricklayer who only has to follow the building plan, which is also possible for bricklayers with limited experience or only a few months of training.

[0025] The work of the bricklayer can be simplified even more when the building elements arrive on the site by type, and the relative type of building elements is shown on the pallets in the same way as on the building plan, for example with the same colour or numbering.

[0026] It is clear that the building system can be used for both new construction and renovation, whereby for example a new outside wall is built around an existing home as an additional skin or to replace the old existing skin.

[0027] Also disclosed is a joining element suitable for use in a building system as disclosed, whereby the joining element has an L, T or cross-shaped cross-section and an upward facing edge.

[0028] The invention concerns a fastening element suitable for use in a building system as described above, whereby the fastening element is in the form of a mainly L-shaped profile and a cooperating pin, whereby one leg of the L-shaped profile may have a folded over edge and of which the other leg has a feed-through hole for the pin for fastening the fastening element to the interior wall and whereby the pin has means to be able to fix the pin with respect to the L-shaped profile and whereby the above-mentioned means consist of an adjusting screw applied fixed on the pin and a clamping screw rotatably applied on the pin and a washer applied loose against a stopper fixed on the pin, whereby the adjusting screw and the clamping screw fit through the above-mentioned feed-through hole and the washer does not, whereby the washer can be situated behind the folded over edge of

the L-shaped profile and whereby the L-shaped profile can be clamped between the clamping screw and the stopper on the pin.

[0029] When the washer will be situated behind the folded over edge of the L-shaped profile, the L-shaped profile and the pin will be fixed with respect to one another and they will form a fixed whole.

[0030] With the phrase "a fastening element suitable for use in a building system as described above" is meant that the fastening element can also be used in other building systems, including but not limited to traditional building systems whereby individual masonry stones are attached to each other with cement or another adhesive to build a wall.

[0031] With the intention of better showing the characteristics of the invention, preferred embodiments of a fastening element for use in a building system for building a wall in masonry stones are described hereinafter, by way of an example without any limiting nature, with reference to the accompanying drawings, wherein:

figure 1 schematically shows a perspective view of the construction of an outside wall according to the building system as disclosed;

figures 2 to 9 show different possible types of building elements suitable for use in a building system as disclosed;

figure 10 shows a building plan and corresponding pallets with building elements per type as to be delivered on the construction site;

figure 11 schematically shows the construction of a wall with building elements;

figure 12 schematically shows a perspective view of a joining element as disclosed;

figure 13 schematically shows a cross-section of the joining element from figure 12, but applied in a masonry stone;

figure 14 schematically shows a perspective view of a fastening element according to the invention;

figures 15 to 17 show an anchoring of an outside wall to an interior wall using a fastening element according to the invention;

figures 18 and 19 schematically show a perspective view of different possible building elements.

Figures 20 and 21 show alternative embodiments of construction of the L-shaped profile 22.

[0032] Figure 1 shows the foundations of a building 2 to be built with two separate layers 3 of different types of prefab building elements 4 as they must be placed on the foundations 1 to build an outside wall or wall 5.

[0033] The foundations 1 must be perfectly level and the required waterproof membranes are correctly applied.

[0034] Some possible forms of building elements 4 are shown in figures 2 to 7, whereby these are made up of two or more layers 6 of masonry stones 7 that are bricked, adhered or suchlike on each other according to a required

bond.

[0035] The building elements 4 are provided on at least one side with a stepped shape such that the building elements 4 fit sideways with their stepped side 8 against each other and on each other without an intermediate layer of adhesive or mortar to form layers 3 as illustrated in figure 1.

[0036] The building elements 4 are preferably shaped and sized so they can be handled and laid by one person, and preferably weigh no more than 20 kilograms. Handling by two persons is also among the possibilities, whereby in that case the building elements 4 are preferably not heavier than 40 kilograms. It is obviously not excluded that the building elements 4 are heavier than 20 kilograms or 40 kilograms.

[0037] The forms in figures 2 to 9 are intended for the construction of straight walls, whereby:

- the building elements 4 of figure 2 are flat building elements 4 to mark out a door or window opening, with on one side a stepped form 8 and on the other side a straight form 9 to form the reveal of the opening whereby the stepped side can be either positive, negative or straight or a combination thereof;
- the building elements 4 in figures 3, 4, 6, 7, 8 and 9 are provided on both sides with a stepped form 8, by the layers 6 being shifted sideways with respect to each other, whereby the stepped form can be either negative or positive, straight or a combination thereof;
- the building element 4 of figure 5 are angled building elements 4 to form outside wall corners that on both sides are provided with a stepped form 8 and
- whereby the different forms differ from each other in the number of masonry stones per layer 6, but whereby the number of layers 6 is the same for all building elements 4, although this is not strictly required.

[0038] The number of layers 6 can differ for different building levels 3.

[0039] Figure 5 shows an example of an angled building element 4, required to be able to build an outside wall corner, whereby the sides on one or on both sides have a stepped form 8. The stepped form can depending on requirements be either negative or positive, straight or a combination thereof;

Figures 6 and 7 show flat building elements 4 that can be used to form a gable, whereby these building elements 4 have one or two stepped sides 8, whereby the stepped sides 8 can be both positive or negative. The building elements 4 in figures 2, 3 and 4 can also be used in a gable.

[0040] Figure 8 shows a building element 4 with straight toothing that is obtained by applying for example the so-called Flemish bond or English bond or suchlike

used instead of the half-brick bond in the previous figures.

[0041] Figure 9 shows a building element 4 with oblique toothing along the left-hand side that is partly positive and partly straight, with along the straight side straight toothing.

[0042] It is not excluded that building elements 4 as shown in figures 8 or 9 are provided with one straight side 9, as in figure 2.

[0043] It is also possible that flat building elements 4 are provided with a straight form 9 on both sides. Such building elements 4 can have different widths consisting of two or more layers 6 of masonry stones 7.

[0044] It is preferable, as illustrated in figure 10, to on the basis of the architect's plan make a building plan 12 on which the required building elements 4, according to the available forms and types, are drawn and the different types are specified, for example by colours or numbering or by shading as is the case in figure 10.

[0045] A suitable computer program can be helpful in this as the form and the dimensions of the building elements 4 can differ according to the type of masonry stone and the required bond chosen by the principal.

[0046] Based on the building plan 12 the required types and quantities per type of building element 4 can be determined and supplied in the appropriate quantities per type on the site, preferably on pallets 13 marked per type in the same way as on the building plan 12, for example with the same colour or shading.

[0047] That makes it particularly easy for the bricklayer, considering he can read building element per building element off the building plan 12 and take a building element 4 of the relative type from the relative pallet 13, whereby the outside wall can be built as a jigsaw puzzle.

[0048] Figure 10 also shows the construction of a gable using the building elements 4, whereby the inclination is formed by making use of the necessary building elements 4 and, if they protrude from the gable, by sawing them up beforehand in the workshop such that they fit on the site.

[0049] Although the building elements 4 are provided to be able to be manually picked up and laid by one person or by two persons, it is possible to ease the work by using an appliance for hoisting and placing building elements 4 from pallets 13 on the ground.

[0050] The building elements 4 can be manufactured by stacking the masonry stones in a mould provided to that end and joining them to each other by means of adhesive or mortar and holding or preserving them temporarily in the mould until the adhesive or mortar has sufficient bonding to be able to handle the formed building elements 4.

[0051] Alternatively, the building elements 4 can be manufactured by clamping masonry stones 7 layer per layer 6 in their desired position against a plate in the desired position in relation to each other and joining them to each other by means of adhesive or mortar and holding or preserving them temporarily in that position until the adhesive or mortar has sufficient bonding to be able

to handle the formed building elements 4.

[0052] Here the building elements 4 are manufactured according to a freely chosen brickwork bond.

[0053] The placing of the building elements 4 on the construction site takes place without mortar or adhesive, in other words: the outside wall 5 can be built without using mortar, adhesive or suchlike.

[0054] Instead of this, use is made of a joining element 14.

[0055] To this end, the building elements 4 are provided with a groove 15 in an outer layer 6 of masonry stones 7.

[0056] On the other outer layer of masonry stones 7 the joining element 14 is laid with an upward facing edge 16. The joining element 14 is lath-shaped in the example shown.

[0057] It is possible that the joining element 14 is already applied or fixed to the building elements 4 beforehand, as shown in the building elements 4 of figures 2, 3, 6, 7, 8 and 9, but it is also possible that the joining element 14 is only fixed in or on the building element 4 on-site when the outside wall is being constructed.

[0058] In figure 6 the joining element 14 is applied on the shortest layer 6, while in figure 7 the joining element 14 is applied on the longest layer 6. By placing both building elements 4 side by side with their joining elements 14 facing upwards, walls and gables too can be constructed.

[0059] As regards the building elements 4 with two straight sides, a joining element 14 can be provided both on the outer layers 6 and on the sides.

[0060] This will allow such a building element 4 to be placed transversely so the layers 6 run vertical instead of horizontal and to join the straight sides to adjacent building elements 4 with the joining element 14.

[0061] In this case the flat side of an adjacent building element 4, for example the building element 4 from figure 2, must be provided with a groove 15 in its straight side.

[0062] Figure 11 shows a possible construction of a wall with building elements 4 with two straight sides.

[0063] A possible embodiment of the joining element 14 is shown in figures 12 and 13. As shown in these figures, the joining element 14 is lath-shaped.

[0064] The cross-section of the joining element is in this case cross-shaped, but T-shaped or L-shaped would also be possible.

[0065] Both outer layers 6 of masonry stones 7 are then provided with a groove 15, whereby the joining element 14 is cemented or adhered in one of the grooves 15 with a flange 17a by means of adhesive or mortar 18.

[0066] By cementing or adhering the joining element 14 in the groove 15, the thickness or the height of the building element 4 will remain guaranteed because the flanges 17b of the joining element 15 rest flat on the masonry stones 7.

[0067] The outside wall 5 is built by simply fitting or sliding together grooves 15 and upward facing edges 16 of overlying building elements 4. The orientation of the

building elements 4, meaning whether the groove 15 or the edge 16 is facing upwards, is then of no consequence.

[0068] By choosing the correct thickness of the flanges 17b, the flanges 17b will automatically give the correct joint thickness between two building elements 4 on top of each other.

[0069] When placing the building elements 4 the necessary measures must be taken so the vertical joints between the building elements 4 are equal to the vertical joint between the masonry stones 7.

[0070] In another embodiment the cross-section could also be L- or T-shaped, whereby the joining element 14 would be adhered or mechanically fastened to an outer layer 6 of masonry stones 7. The building element 4 then only has to be provided with one groove 15.

[0071] The joining element 14 is preferably fastened on the top layer 6 of masonry stones 7, but it is not excluded that this is on the bottom layer 6.

[0072] In this case the adhesive or mechanical fastening with which the joining element 14 is fastened on the building element 4 will have to be accurately applied, considering its thickness in this case will have an influence on the dimensions of the building element 4.

[0073] The joining element 14 is preferably made of aluminium, but the disclosure is not limited in this respect. Stainless steel and/or other materials are also among the possibilities.

[0074] The joining element 14 preferably extends as good as across the whole length of the relative outer layer 6 of masonry stones 7, but it is obviously not excluded that different shorter joining elements 14 are used that are successively applied in a groove 15 of a building element 4, contiguously or with a space between two consecutive joining elements 14.

[0075] A joining element 14 will preferably protrude in part in its longitudinal direction along one side over the masonry stones 7, for example over a distance of 0.5 to 15 millimetres. With the construction of the wall, this protruding part will come in the groove 15 of an adjacent building element 4 and ensure that the wall is stronger and easier to align.

[0076] For building elements 4 with straight sides the joining element 14 ends to a distance of for example 5 millimetres from the end of the straight side of the building element 4 so the joining element 14 is not visible.

[0077] As shown in figure 12, the joining element 14 is preferably provided with a local break 19 in one of the flanges 17b, so the groove 15 is freely accessible at the location of this break.

[0078] It is obviously possible to have a number of such breaks 19 and/or that the break 19 is applied in a number of flanges 17b.

[0079] To strengthen the outside wall 5 the building elements 4 can be anchored to the interior wall 20 by means of fastening elements 21 as shown in figure 14.

[0080] The fastening elements 21 are preferably formed by a mainly L-shaped profile 22 and cooperating pin 23, whereby one leg of the L-shaped profile 22 has

a folded over edge 24 intended to be applied in the groove 15 and of which the other leg has a feed-through hole 25 for the pin 23 for the attachment of the L-shaped profile 22 to the pin 23 to be able to fix the fastening element 21 to the interior wall 20.

[0081] It is possible that the dimensions of the L-shaped profile 22 and the folded over edge 24 are smaller than these of the opening 19, so the L-shaped profile 22 can be shifted some millimetres to the left or to the right in the length of the groove 15, depending on the necessity of fastening.

[0082] The pin 23 can differ in length according to requirements. The one leg of the L-shaped profile 22 does not have to be provided with a folded over edge 24. It is also possible that the L-shaped profile 22 does not have such a folded over edge 24. In this case the L-shaped profile 22 will be fixed by means of mechanical attachment or screws to a building element 4, on an outer layer 6 of masonry stones 7.

[0083] Figure 14 shows such a fastening element 21 and figures 15 to 17 show the anchoring of an outside wall 5 to an inside wall 20 using the fastening element 21.

[0084] The pin 23 has means 26 to be able to fix the pin 23 with respect to the L-shaped profile 22.

[0085] The abovementioned means 26 consist of an adjusting screw 27 fixed on the pin 23 and a clamping screw 28 rotatably applied on the pin 23, whereby the adjusting screw 27 and the clamping screw 28 fit through the abovementioned feed-through hole 25. A larger washer 29 loosely fitted against an upright side or stopper 35 on the pin 23 ensures a fixed, but sufficiently moving whole between the stopper 35 of the pin 23 and the clamping screw 28 by sliding the washer 29 behind folded over edges 30 of the L-shaped profile 22.

[0086] The clamping screw 28, which is now positioned against the L-shaped profile 22 is not tightened just yet, but ensures in the first instance that the washer 29 remains in the correct place in the folded over edges 30 of the L-shaped profile 22, such that the L-shaped profile 22 and the pin 23 form are not movable with respect to one another during adjustment with the adjusting screw 27. The adjusting screw 27 allows for a movement to and from the interior wall 20 of the pin 23 and the L-shaped profile 22. After adjustment, the clamping screw 28 can be definitively tightened, so the washer 29 and the L-shaped profile are fixed between the clamping screw 28 and the stopper 35 of the pin 23.

[0087] After placing a building element 4, several centimetres above the break 19 in the joining element 14 a hole 31 is drilled through the cavity insulation 32 to a certain depth in the interior wall 20, after which a plug 33 is fitted in this hole to anchor the pin 23 in the interior wall 20. After a building element 4 is placed and the pin 23 has been anchored in the plug 33, an L-shaped profile 22 is placed horizontal with its feed-through hole 25 over the pin 23 against the loose washer 29 that is positioned against the stopper 35 of the pin 23 stands. This is shown in figure 15. The lateral movement, in the case of figure

15 to the left, slides the loose washer 29 between the folded over flanges 31 of the L-shaped profile 22. In this way a fixed, but still sufficiently moving, cooperating and adjustable whole is obtained with sufficient space above the building element 4 to bring the L-shaped profile 22 from a horizontal to a vertical position whereby the folded over edge 24 arrives in the groove 15 at the location of the break 19.

[0088] By starting the mounting of the L-shaped profile 22 from a horizontal position and then bringing it to a vertical position, rather than mounting the L-shaped profile 22 starting from the vertical position, it can be ensured that a short lever can be obtained between the pin 23 and the building element 4.

[0089] As already mentioned above, the L-shaped profile 22 will be able to move several millimetres in the groove 15, so limited play in the fastening is obtained.

[0090] Then the depth to which the pin 23 is applied in the hole 31 can be somewhat changed by turning the adjusting screw 27 before the clamping screw 28 is fixed on the pin 23.

[0091] By tightening this adjusting screw 27, the fastening element 21 moves closer or further away so the building block 4 can be adjusted and the outside wall 5 is fully and correctly aligned. Once correct adjustment has been obtained, the clamping screw 28 can be definitively tightened, so the washer 29 and the L-shaped profile 22 are fixed between the clamping screw 28 and the stopper 35 of the pin 23. This is shown in figure 17.

[0092] In this way the outside wall 5 is firmly anchored building element 4 after building element, so large parts of the outside wall 5 can be constructed without having to be afraid that a wind gust or another unforeseen load could cause the new brickwork to sink or fall over.

[0093] It is important to note that the L-shaped profile 22 can no longer be lifted out of the groove 15 once the overlying layer of building elements 4 has been placed.

[0094] The building elements 4 are supported above window, door or other openings by L-shaped lintels as in traditional brickwork.

[0095] It is clear that the building elements 4 can already be provided with L-shaped profiles 22 beforehand. This means: the L-shaped profiles 22 are fastened with folded over edge 24 in the groove 15, at the location of the break 19, for example when the joining element 14 is adhered or mechanically fastened to the building element 4. The fastening pin 23 and the associated means 26 will then be adapted and applied in a suitable fashion.

[0096] According to a preferred characteristic, the pin 23 is provided with size indication from which it is clear how deep the pin 23 is inserted in the hole 31.

[0097] This has the advantage that when a first pin 23 is inserted and adjusted, one can read off how deep the pin 23 goes into the hole, so the same depth can be used for the other pins 23 without having to measure after which the L-shaped profile 22 is fixed to the pin 23.

[0098] This size indication can be in different forms: for example by parallel numbered lines on the pin 23, as

on a measuring rule, or with consecutive coloured rings on the pin 23.

[0099] Because the building elements 4 always have the same height and because the pin 23 with its size indication in numbered lines or coloured rings can be adjusted consistently, traditional means such as building struts and bricking cords to keep a wall horizontally and vertically straight are no longer required. The traditional system can however also be used. One must, however, ensure that the wall against which the pin 23 fixed is vertical and the foundations on which the first layer of building elements 4 is applied is horizontal.

[0100] In a last step a pointing mortar can be applied in all joints. The flanges 17b of the joining element 14 will keep the pointing mortar in the horizontal joint between the building elements 4 so during pointing the pointing mortar cannot arrive in the cavity wall, i.e. the space between the outside wall 5 and the inside wall 10.

[0101] If the masonry stones 7 are cemented on each other with a mortar with a joint thickness of for example one centimetre, the flange 17b will also be approximately one centimetre thick so a joint of one centimetre can be obtained between the respective building elements 4. Obviously the thickness of the flange 17b will determine the thickness of the joint. If the masonry stones 7 of a building element 4 are adhered on top of each other so there is no actual joint between the masonry stones 7, the flange 17b will only be a few millimetres thick as there is also no need for a joint between the building elements 4.

[0102] At the stepped sides of the building elements 4 a seal will be placed to allow the pointing of the stepped sides, whereby this seal will also prevent pointing mortar from getting into the cavity wall.

[0103] If building elements 4 are applied with straight toothing 8, as shown in figures 8 and 9, the construction method will differ somewhat from that described above.

[0104] Indeed, it will then not be possible to have the building elements 4 lower vertically over the joining element 14 of underlying building elements 4. The building elements 4 must be slid into place sideways over the joining element 14.

[0105] The last building element 4 of a building level 3 and the corner building elements 4 will however not be able to be slid in sideways.

[0106] To solve this, with such building elements 4 the groove 15a on the rear, being the cavity side, is ground out. This is shown in figures 18 and 19, for a corner building element 4 and a flat building element 4, respectively.

[0107] With a corner building element 4 the groove 15a on one side of the corner is fully ground out.

[0108] The corner building element 4 can be slid with the other not ground out side with its groove 15 sideways over the joining element 14 of the underlying building level 3.

[0109] By not yet fully sliding the corner building element 4 against the adjacent building element 4, the last building element 4 can be placed, after which one can

slide the corner building element 4 into place, whereby the ground out side of the corner building element 4 is placed against the joining element 14. This means this last joining element 14 is not clamped.

[0110] For a building element 4 as shown in figure 19, this building element will be able to be placed last, whereby the groove 15a of the building element can be placed against the upward facing edge 16 of the joining element 14 by sliding it perpendicular to the surface of the wall 5. Here at least one additional fastening must preferably be made to the laterally located building element 4.

[0111] This can for example, but not necessarily, be done using a pre-inserted pin 34 on the rear of the relative building element 4.

[0112] After placing the building element 4 this pin 34 will be extended and clamped behind the lateral building element 4.

[0113] The abovementioned method is possible both with adhered brickwork, with a joint of for example 3 millimetres, and with brickwork with a joint of 10 millimetres or more.

[0114] In the case of brickwork with a joint of 10 millimetres or more, it is also possible to make the upward facing edge 16 a bit less high than the joint thickness to be provided.

[0115] As a result, the last building element 4 will be able to be slid between the already placed building elements 4 of the building level 3 in a direction perpendicular to the surface of the wall 5, until it comes against the joining element 14 and to be lifted over the joining element 14 after which it drops back into the desired position.

[0116] Preferably, the abovementioned building elements 4 can be manually or machine-made in a workplace. For the latter one can, for example, follow the known techniques of prefab brickwork production.

[0117] It is not excluded that on the rear of larger building elements 4 a reinforcement fabric or net is applied to assure safety during transport and during the placing of the building elements.

[0118] The different modules are placed per type in coloured transport crates or pallets 13, of which for example the colours correspond to the colours mentioned on the building plan 12, for transport to the sites or building locations.

[0119] Figures 20 and 21 illustrate two alternative embodiments for the L-shaped profile 22, not provided with the abovementioned folded over edge 24.

[0120] In figure 20 the break 19 in the flange 17b of the joining element 14 has a T-shape, whereby the one leg of the L-shaped profile 22 has a correspondingly shaped end 36, so it fits in the abovementioned break 19 and is fixed there.

[0121] Also in this case the L-shaped profile 22 will, depending on the necessity of fastening, be able to be slid sideways a few millimetres to the left or right in the break 19, because the latter has slightly larger dimensions.

[0122] Hereby it must be noted that it is of importance

that the larger dimensions of the break 19 preferably only allow lateral movement and no forward and backward movement, meaning the building element 4 or the joining element 14 move away and towards building element 4 or joining element 14. That can be achieved by ensuring that dimensions A and B as indicated on the figure 20 are equal.

[0123] Obviously the specific shape is only one possibility and it is to be understood that other forms than a T-shape are also possible, such as a dovetail form.

[0124] In figure 20 the joining element 14 has a break 19 in the flange 17b and in the upward facing edge 16, so the groove 15 is fully freed.

[0125] The one leg of the L-shaped profile 22 has a feed-through hole 37, so the L-shaped profile 22 can be screwed tight with a screw or suchlike that can be fixed through the feed-through hole 37 in the groove 15.

[0126] The screw can be a regular screw or a screw that expands on the sides when screwing so automatic clamping in the groove 15 takes place.

[0127] Also for these last two embodiments of the L-shaped profile 22 the overlying building elements 4 will stop the L-shaped profile 22 from coming out of the groove 15.

[0128] The present invention is by no means limited to the embodiment described as an example and shown in the drawings, but a fastening element for use in a building system for building a wall in masonry stones can be realised in all kinds of forms, materials and dimensions for various applications such as in walls, floors and ceilings, for use in interior and exterior work on all sorts of buildings and constructions without departing from the scope of the invention.

Claims

1. Fastening element suitable for use in a building system for building a wall (5) in masonry stone (7), whereby one departs from prefab building elements (4) consisting of two or more layers (6) of masonry stones (7) bricked, joined, adhered or suchlike to each other, whereby the building elements (4) have a stepped form (8) on at least one side such that the building elements (4) fit sideways with their stepped (8) side against each other and on each other and can be handled and laid by one person or by two persons, whereby in an outer layer (6) of masonry stones (7) a groove (15) is applied in the longitudinal direction of the masonry stones (7), whereby on the other outer layer (6) of masonry stones a joining element (14) is applied with an upward facing edge (16) and whereby the wall (5) is built with these prefab building elements (4) by fitting the groove (15) and the upward edge (16) of prefab building elements (4) lying on top of each other, into each other without cement, adhesives or suchlike being used on the construction site, **characterised in that** the

fastening element (21) is in the form of a mainly L-shaped profile (22) and a cooperating pin (23), whereby one leg of the L-shaped profile (22) can be fixed on a building element (4) and of which the other leg has a feed-through hole (25) for the pin (23) for attaching the fastening element (21) to an interior wall (20) and **in that** the pin (23) has means (26) to be able to fix the pin (23) with respect to the L-shaped profile (22) and **in that** the above-mentioned means (26) consist of an adjusting screw (27) applied fixed on the pin (23) and a clamping screw (28) rotatably applied on the pin (23) and a washer (29) applied loose against a stopper (35) fixed on the pin (23), whereby the adjusting screw (27) and the clamping screw (28) fit through the above-mentioned feed-through hole (25) and the washer (29) does not, whereby the washer can be situated behind the folded over edge of the L-shaped profile and whereby the L-shaped profile (22) can be clamped between the clamping screw (28) and the stopper (35) on the pin (23).

2. Fastening element according to claim 1, **characterised in that** the one leg of the L-shaped profile (22) is provided with a folded over edge (24).
3. Fastening element according to claim 1, **characterised in that** the one leg of the L-shaped profile (22) has a T-shape (36), dovetail form or similar shape.
4. Fastening element according to claim 1, **characterised in that** one leg of the L-shaped profile (22) has a feed-through hole (37).
5. Fastening element according to claim 4, **characterised in that** the fastening element (21) is further provided with a screw of suchlike that can be fixed through the feed-through hole (37) so the L-shaped profile (22) can be screwed tight.

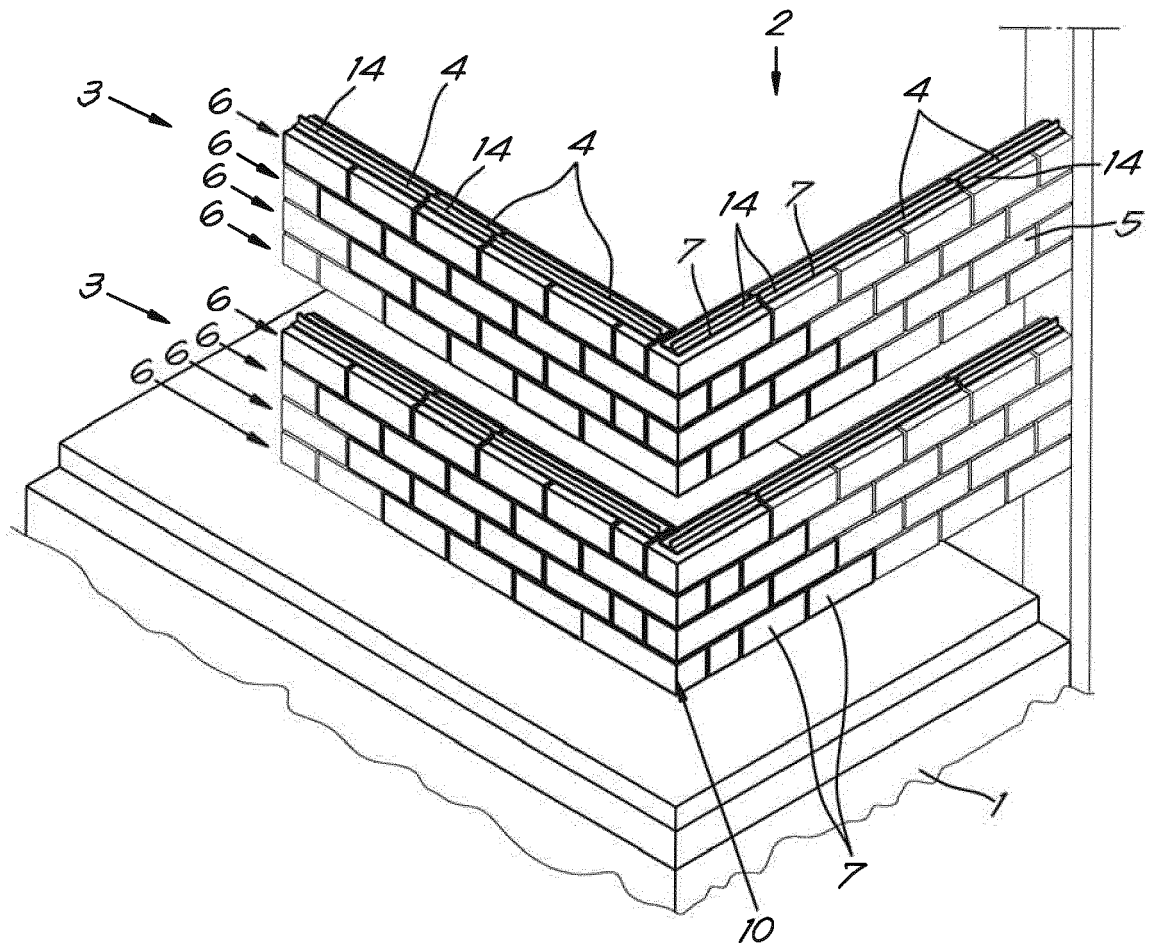


Fig. 1

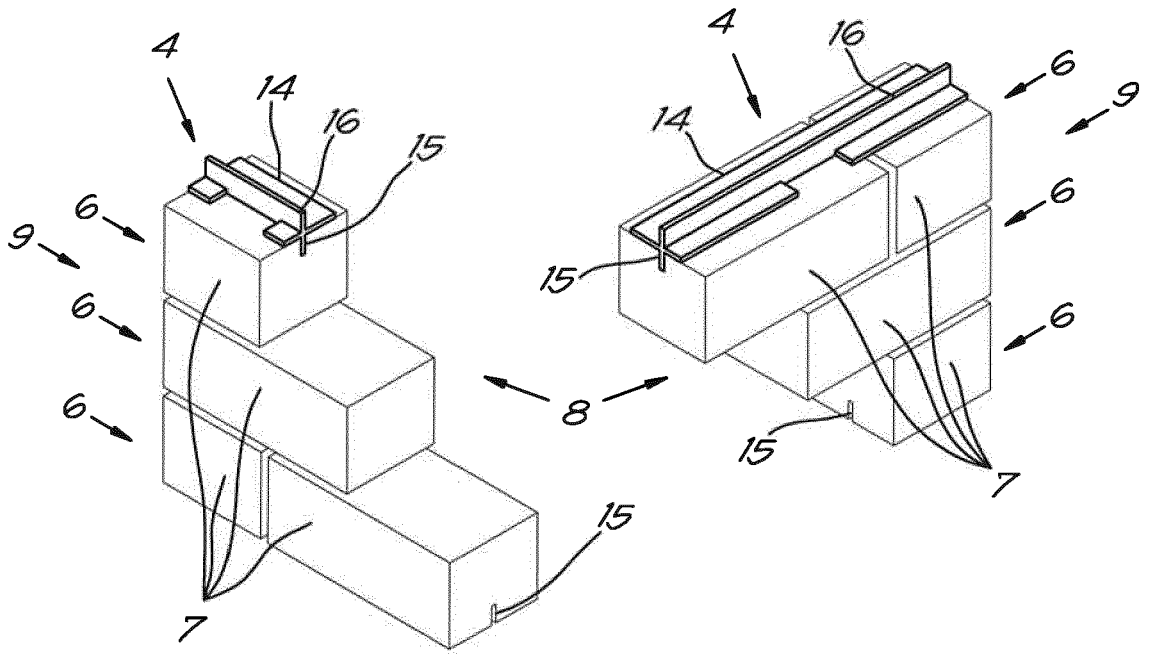


Fig. 2

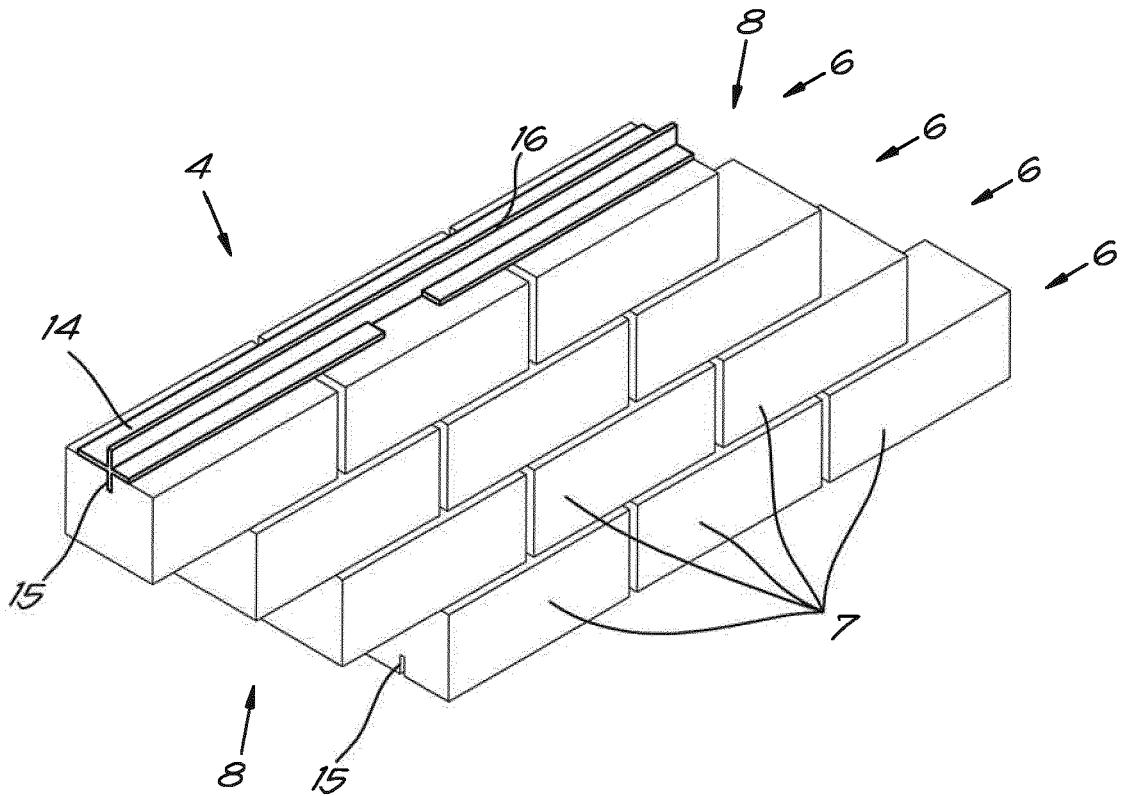


Fig. 3

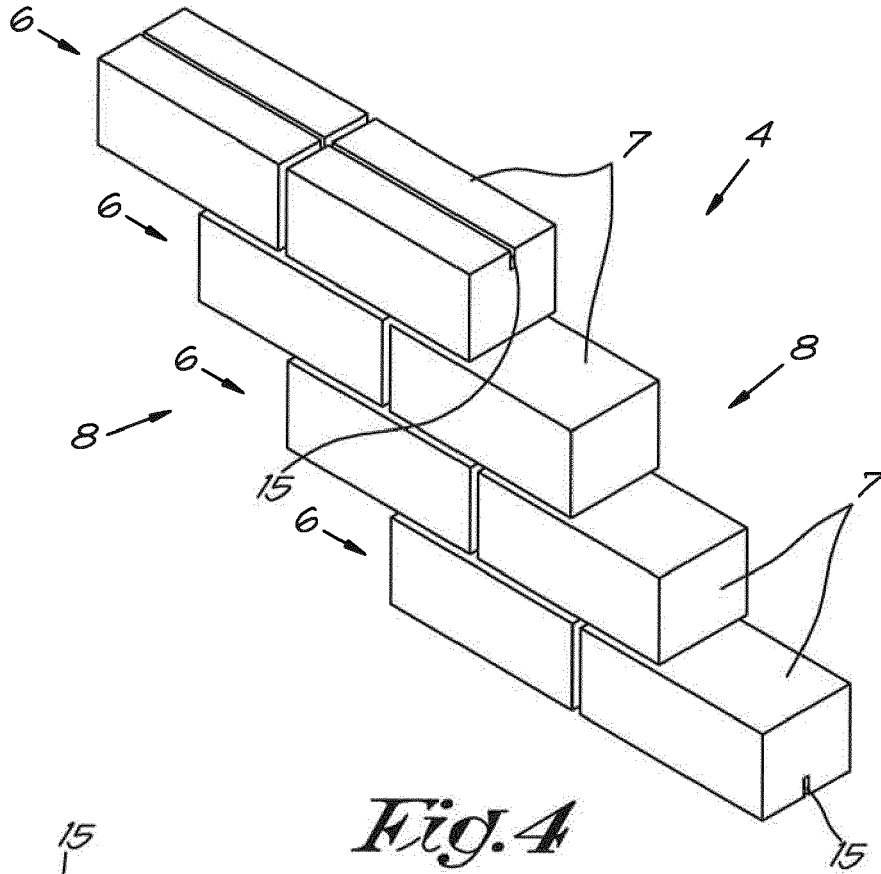


Fig. 4

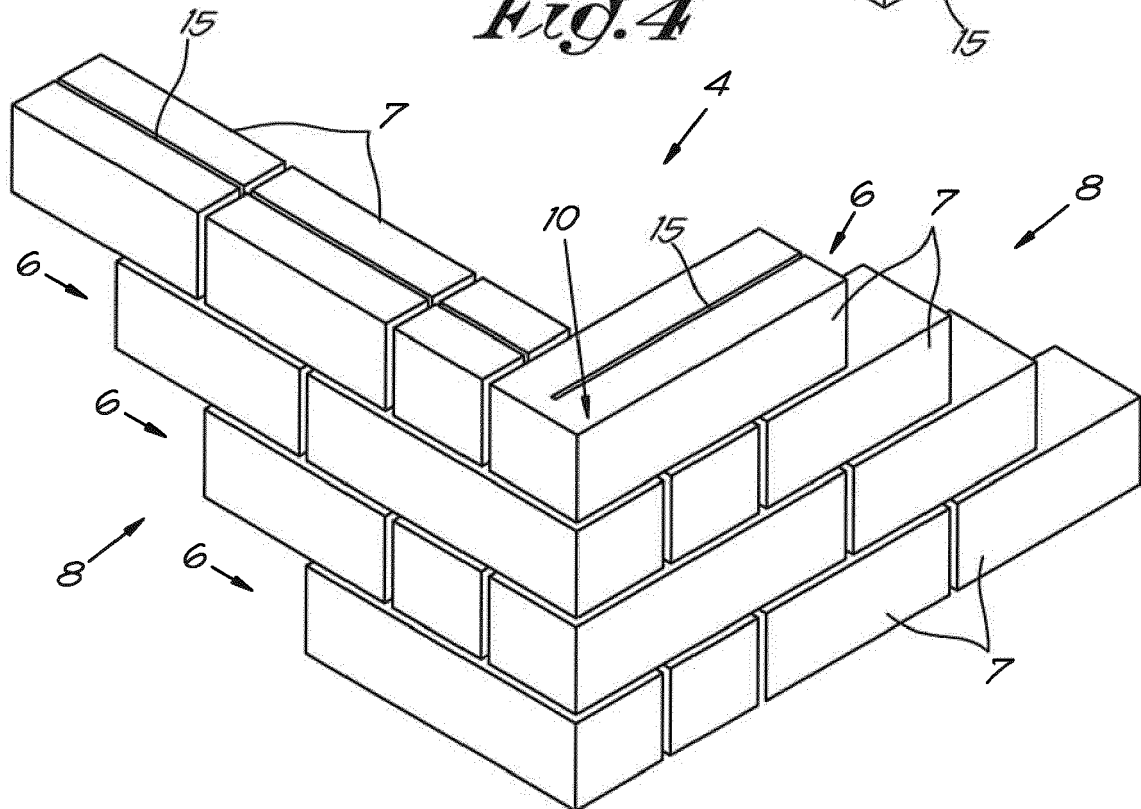


Fig. 5

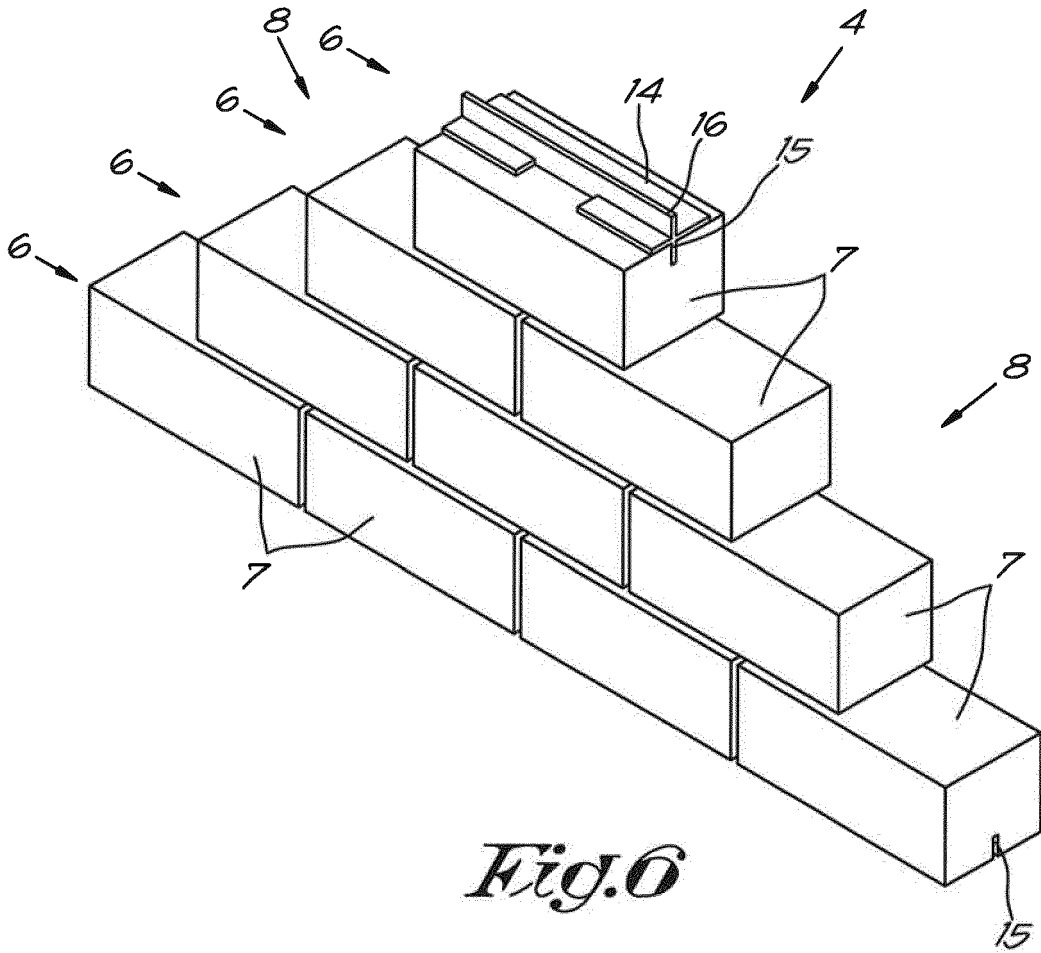


Fig. 6

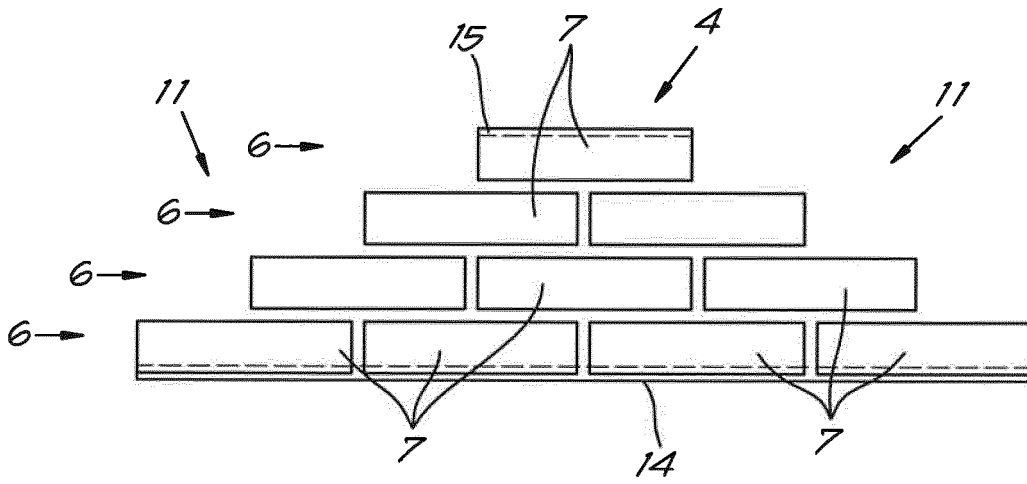


Fig. 7

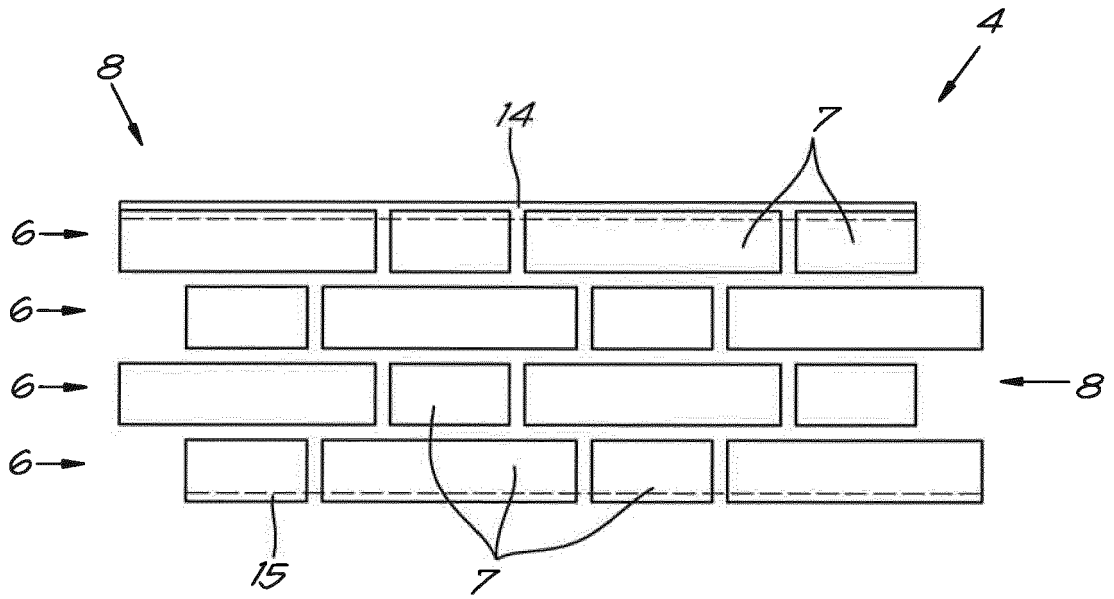


Fig. 8

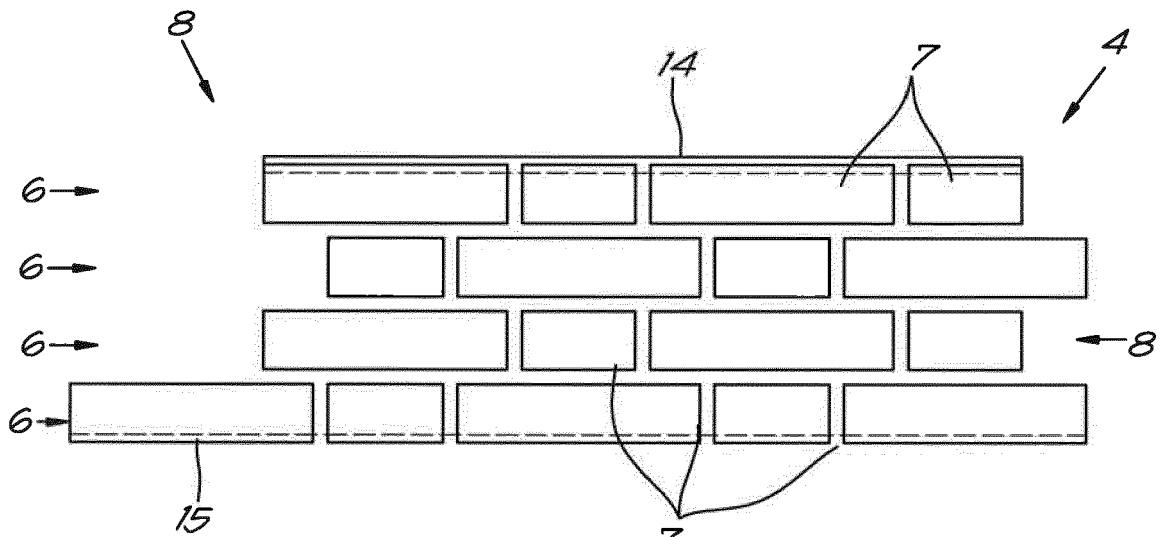


Fig. 9

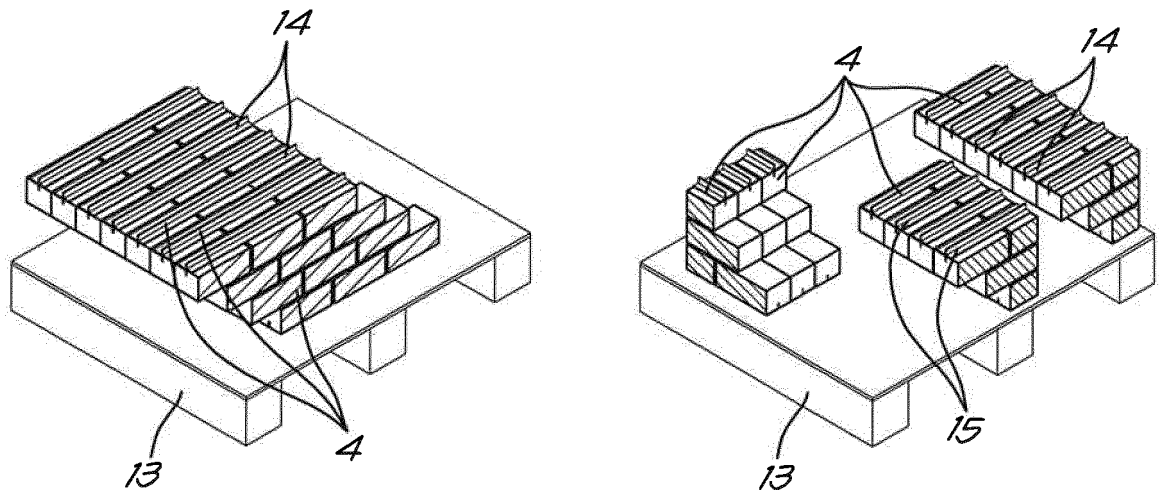
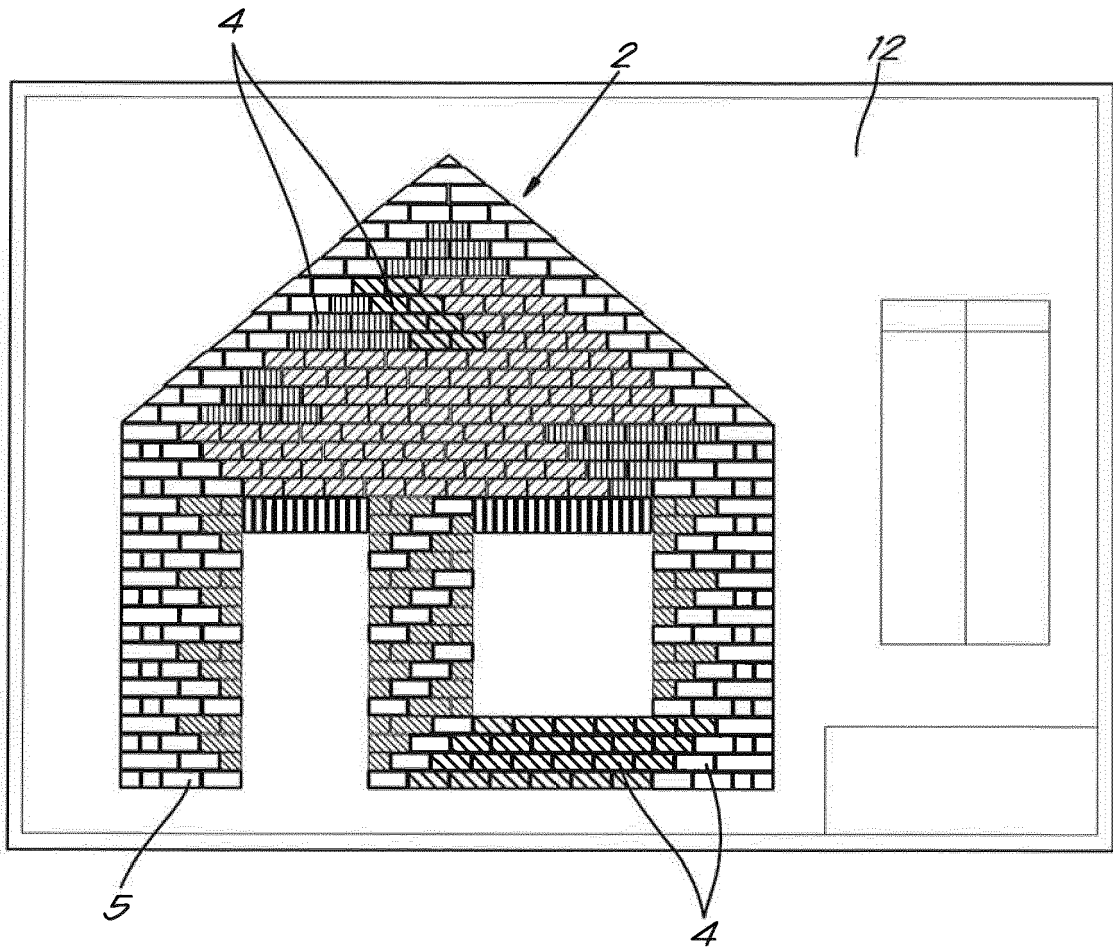


Fig.10

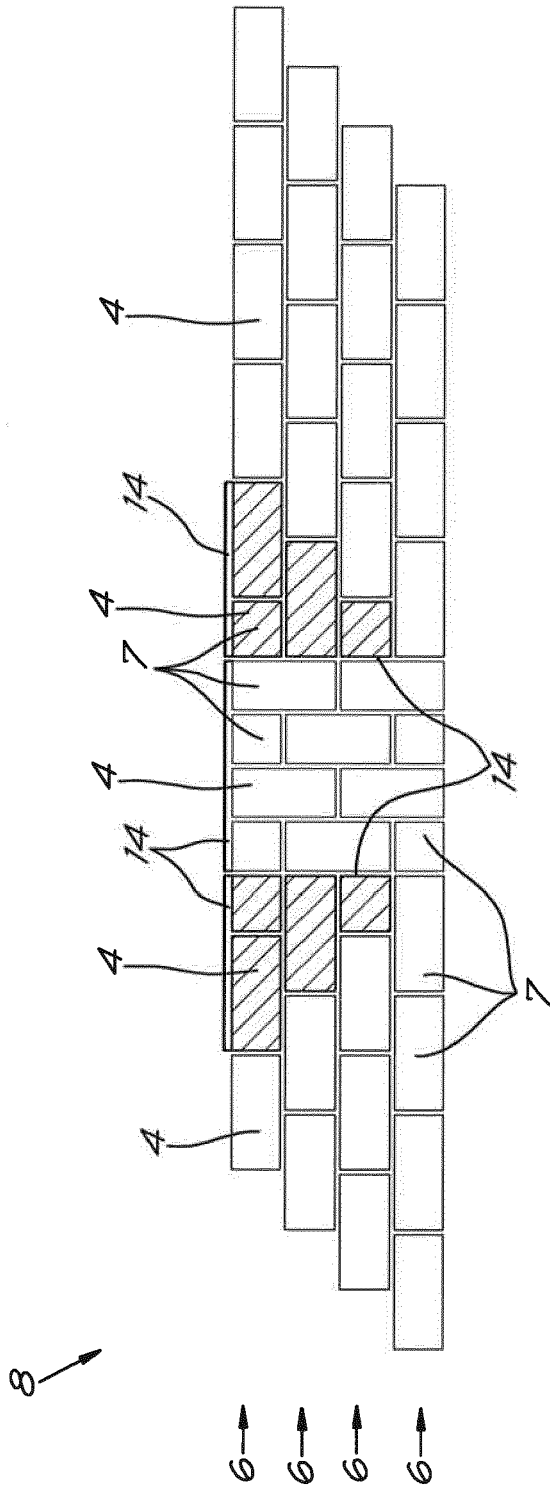


Fig. 11

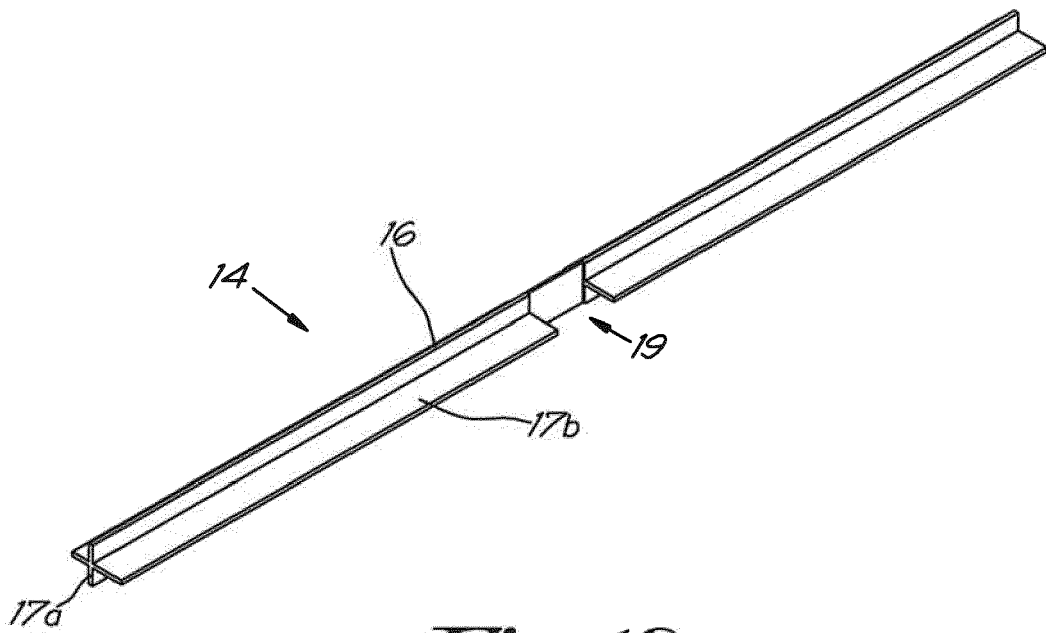


Fig. 12

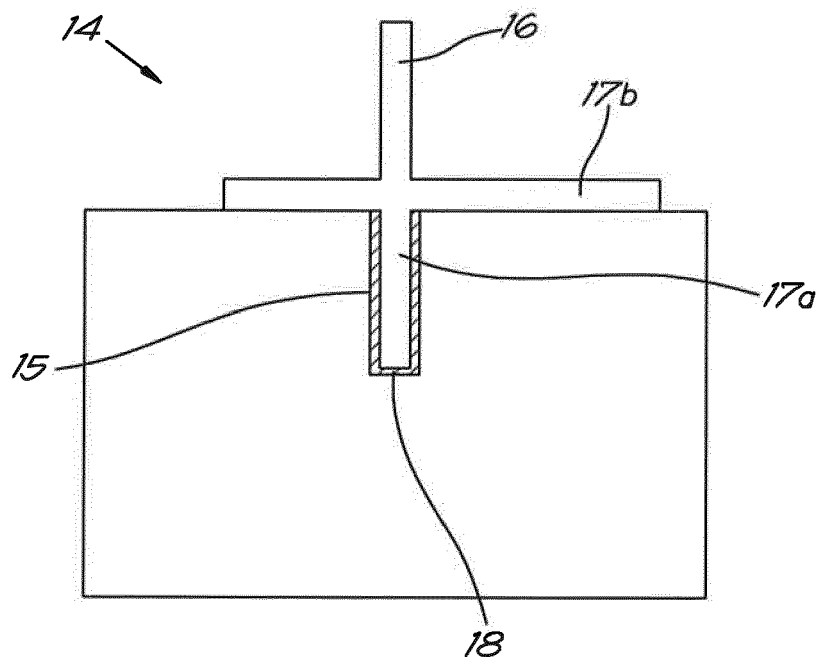


Fig. 13

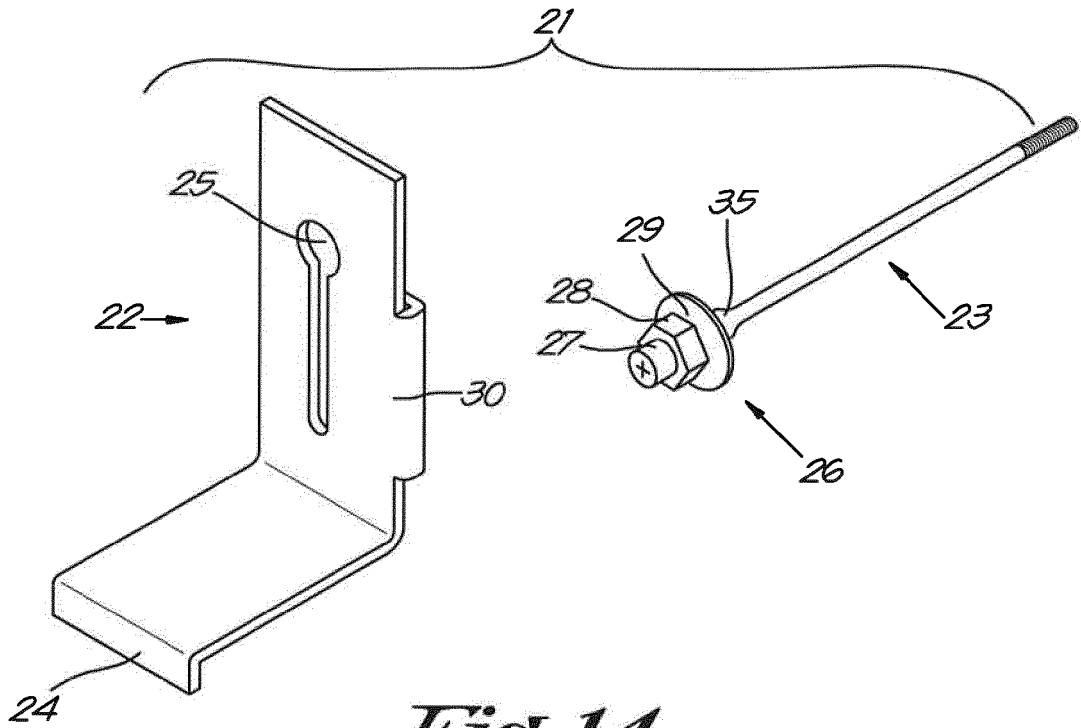


Fig. 14

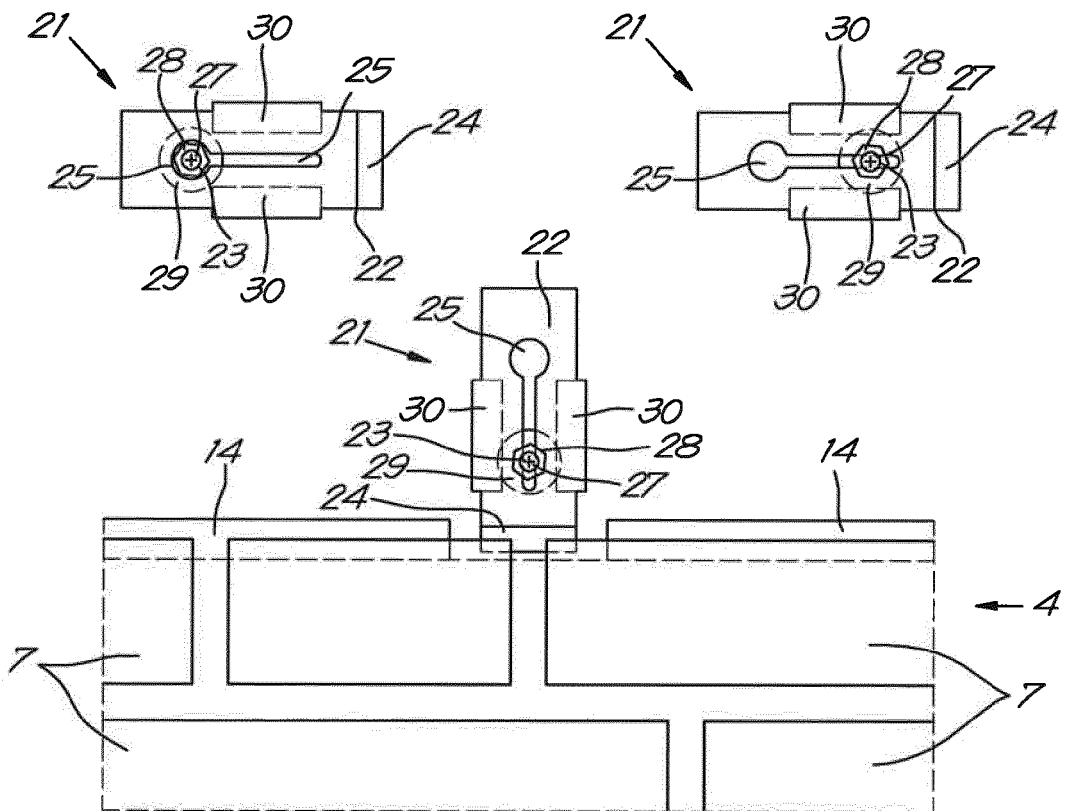


Fig. 15

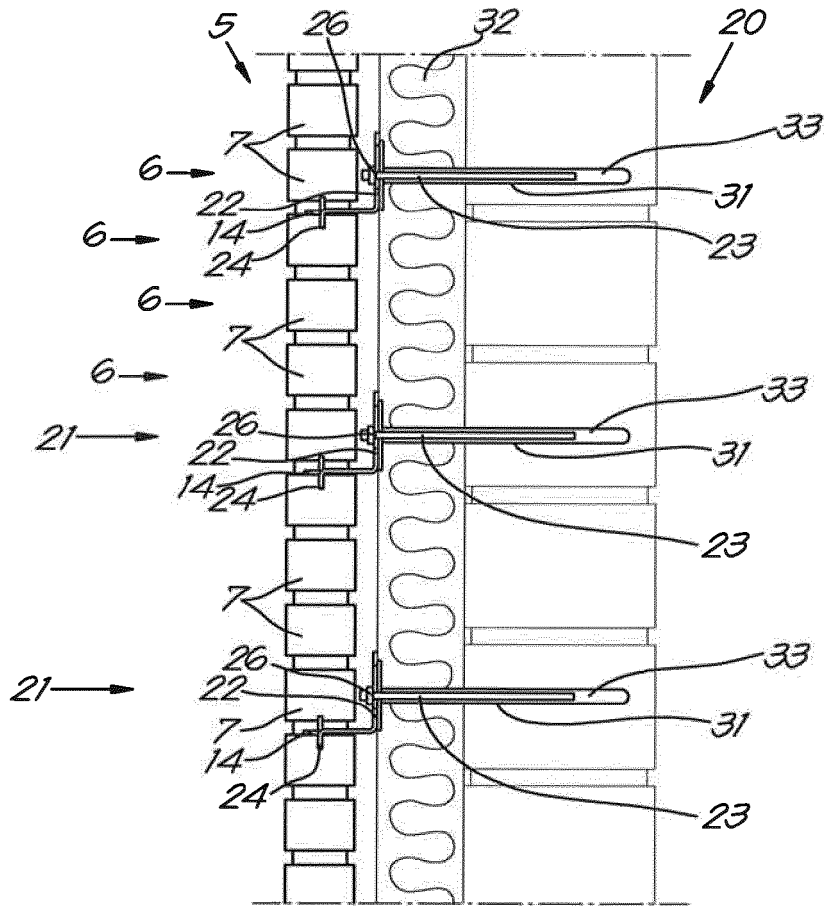


Fig. 16

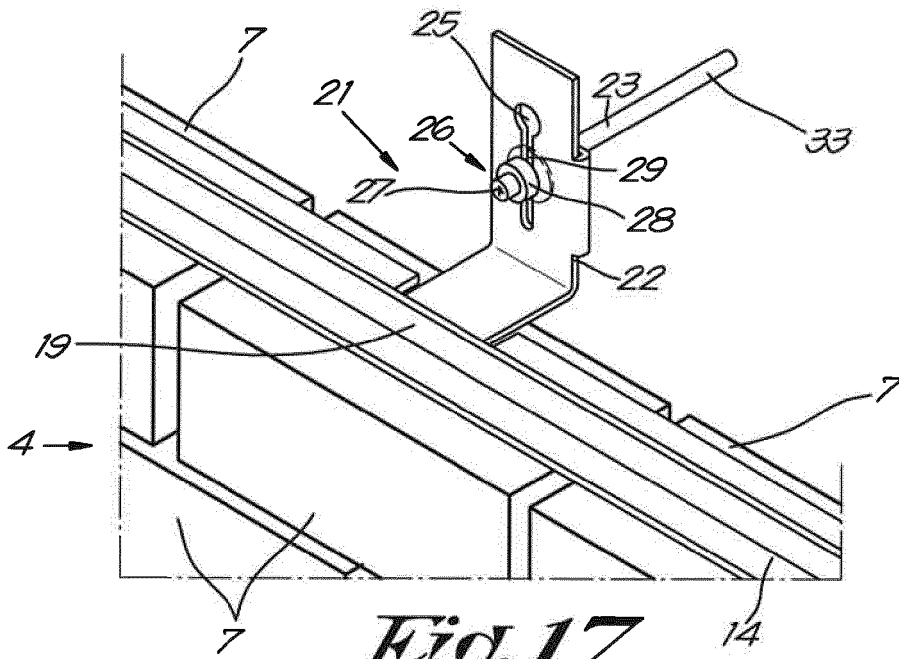


Fig. 17

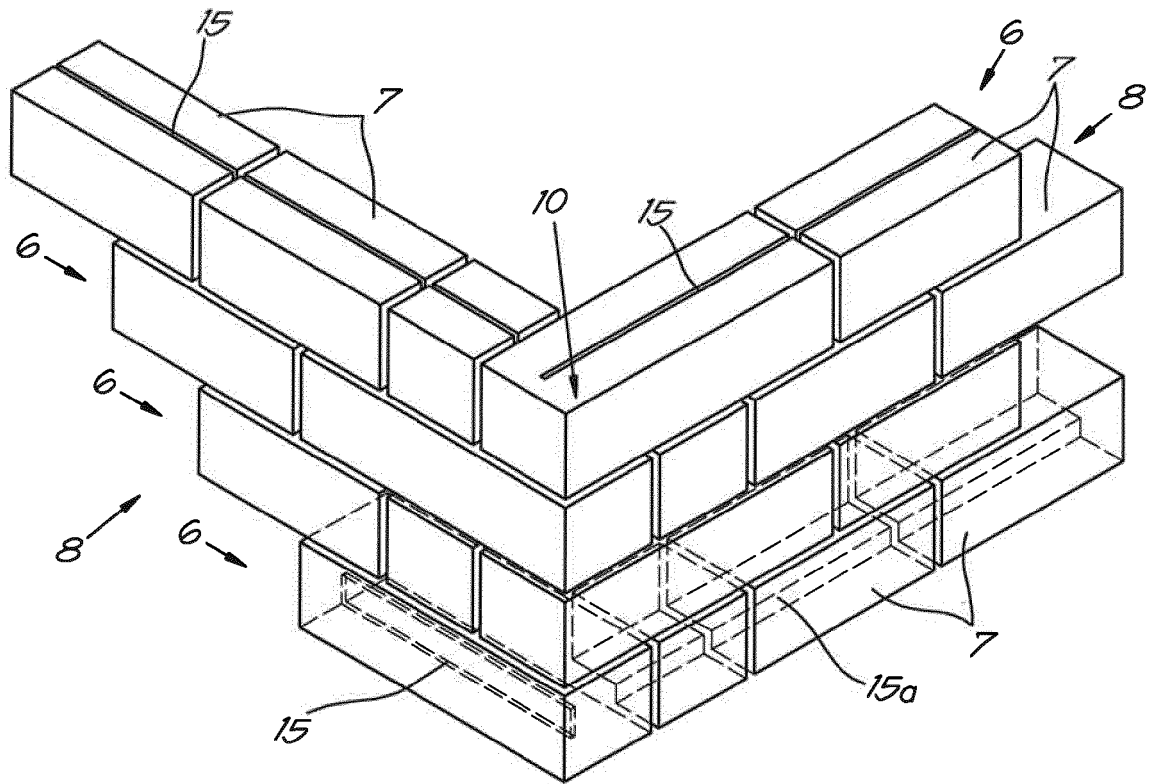


Fig. 18

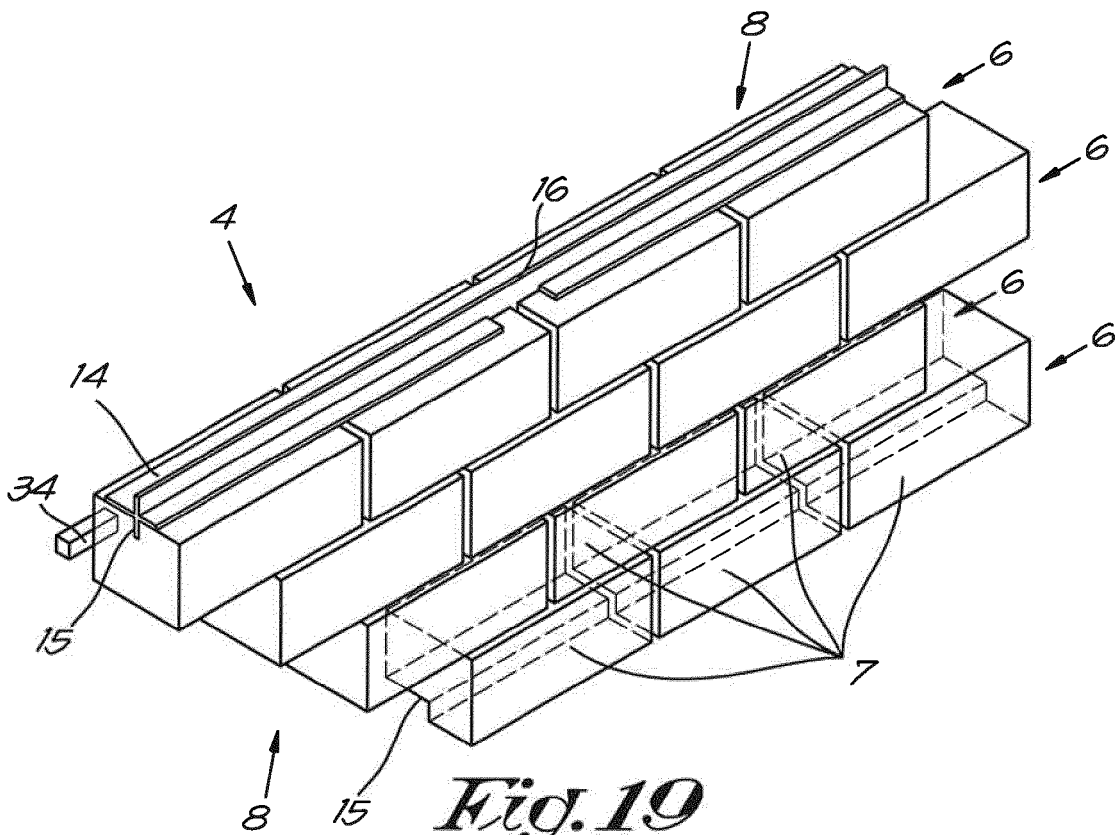


Fig. 19

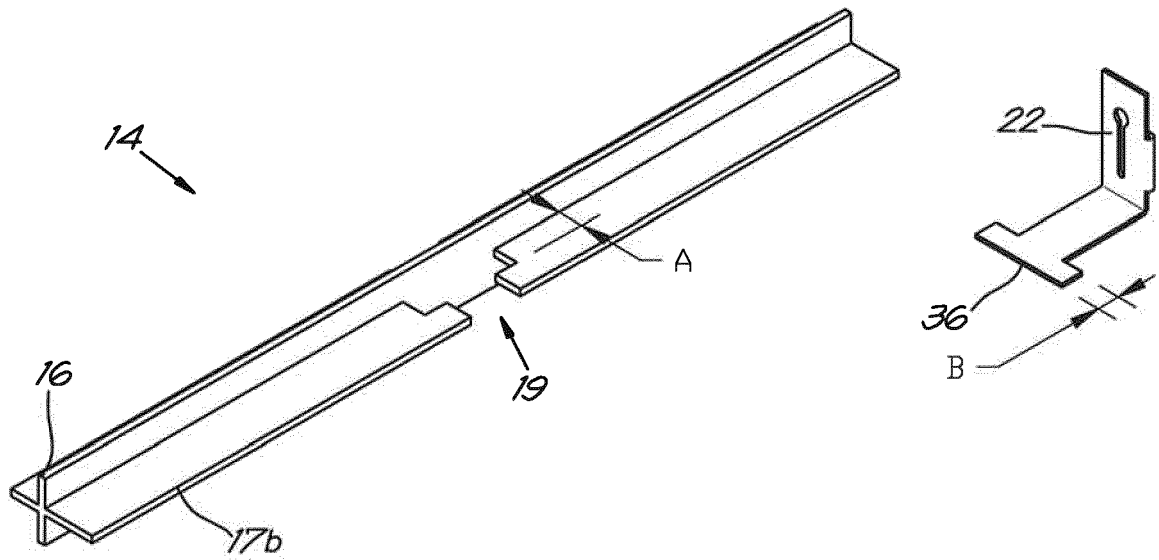


Fig. 20

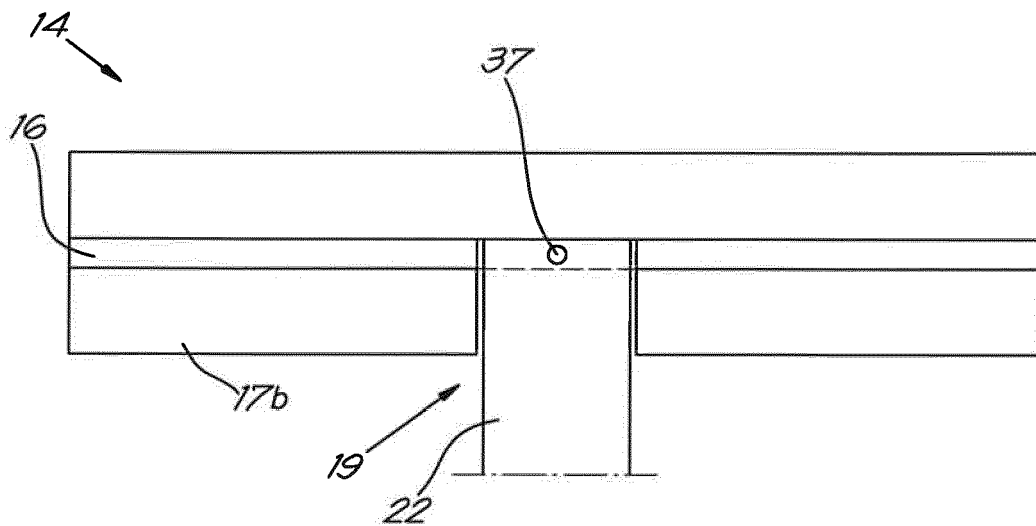


Fig. 21



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