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(54) **SET OF BUILDING BLOCKS AND A MOUNTING SYSTEM**

(57) Building block (1) and mounting system for manufacturing a preferably dry-stacked facade, wherein the rear side (3) of the building block (1) forms a polygon provided with at least a mounting pin (5) which extends through the rear side (3) and which is provided at least

at a vertex (9) of an angle (6, 7) of the polygon, and wherein the mounting system comprises a coupling plate (20) that is provided with recesses (25) for receiving and fixing the pins (5) of adjacent vertices (9) of different adjacent building blocks (1).

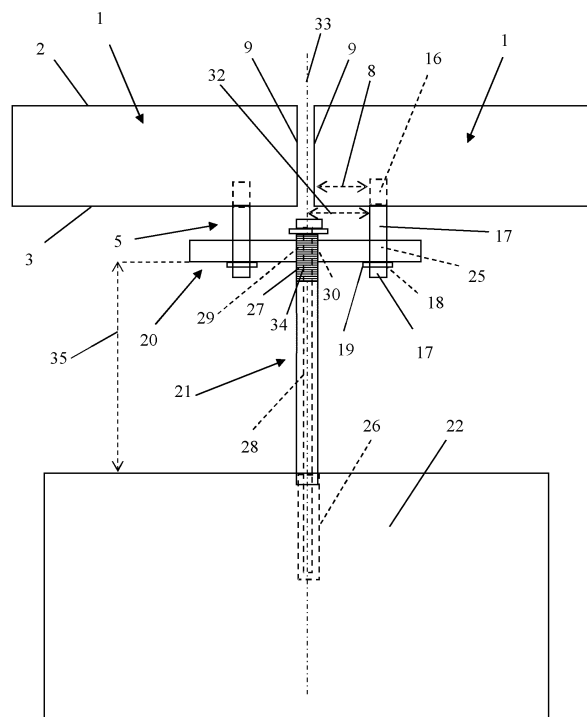


Fig. 17

Description

[0001] The invention relates to a facade system for manufacturing a facade with building blocks and a mounting system, wherein the building blocks are preferably dry-stacked on top of each other.

[0002] These building blocks have a visible side designed to be faced away from a retaining wall, a rear side forming a polygon designed to be faced towards the retaining wall, and side surfaces situated between the visible side and the rear side designed to allow the building blocks to rest on each other.

[0003] The mounting system for the building blocks includes coupling plates and possibly wall ties. The wall tie is designed to be anchored in the retaining wall at one end and further has another end onto which the coupling plate can be attached. In this way, the building blocks are connected to the retaining wall.

[0004] Furthermore, the invention also relates to a method for manufacturing a facade with the building blocks and the mounting system in which the building blocks are stacked on top of each other with the side surfaces, preferably dry-stacked, and are connected to each other by means of coupling plates. The building blocks are preferably turned with the rear faces towards the retaining wall and anchored in this retaining wall with the wall ties.

[0005] According to the current state of the art, facade systems are mostly constructed from different materials that are bonded together, which makes them difficult to be reused. In classic masonry facades, facade bricks are bonded together with mortar. Alternatively, synthetic adhesives are also used to that end. Other systems use sandwich panels composed of different materials that are bonded together. Reuse or recycling of these facades or the materials and components that they are built of is usually not possible.

[0006] Various systems in which facade bricks are dry-stacked on top of each other, without any mortar and/or glue, have already been proposed. These systems usually have a quite complex construction and moreover often raise doubts with regard to their stability.

[0007] Due to their complex construction, these systems are rather limited architecturally as well.

[0008] The invention aims to remedy these disadvantages by proposing a facade system with a building block and a mounting system and also a method in which the constituent parts and/or materials can be easily reused, in which, moreover, a facade system that is not very complex nevertheless offers several implementation options architecturally. Preferably, the invention aims to propose such a facade system with building blocks in which building blocks can be easily stacked on top of each other in different patterns. The building blocks are thereby preferably identical to each other and/or the pattern is preferably completely closed.

[0009] To this end, the invention proposes a set of building blocks and a mounting system, wherein a vertex

of an angle of the polygon of the rear side of the building blocks is provided with a mounting pin at a fixed distance from said vertex extending through the rear side with a free end outside the building block, and wherein the mounting system includes a coupling plate provided with recesses for receiving and fixing the pins of adjoining vertices of different adjoining building blocks, so as to connect these vertices through the coupling plate. Successive recesses are thereby spaced at a fixed distance around a central point at a rotation angle of 10° to 30° relative to each other, as claimed in the appended claims. Preferably, these successive recesses are situated at a rotation angle of 15° or 30° with respect to each other.

[0010] Practically, two sequences of five recesses stand in a twofold rotational symmetry around the central point. In the case of a rotation around a rotation angle of 180° around this central point, the first sequence of five recesses will be situated in the position of the second sequence of five recesses before this rotation.

[0011] Advantageously, twelve recesses are arranged in a twelve-fold rotational symmetry around the central point. In the case of a rotation around a rotation angle of 30° around this central point, the recesses will be situated in the place of the adjacent subsequent recesses before this rotation.

[0012] In a particularly advantageous manner, the angle of the polygon has a size that is a multiple of 15° , in particular a multiple of 30° .

[0013] In a particularly advantageous manner, the angle of the polygon has a size different from 90° .

[0014] In an extremely advantageous manner, the angle of the polygon has a size which is 60° or 120° .

[0015] Preferably, the pin is provided on a line passing through the vertex and forming a partial angle with one leg of the angle, such partial angle amounts to (i) 10° or a multiple of 10° , (ii) 15° or a multiple of 15° , or (iii) 30° or a multiple of 30° .

[0016] In a simple manner, the pin is provided on the bisector of the angle.

[0017] Preferably, at least one other vertex of the polygonal rear side is also provided with a pin, preferably at the fixed distance from said other vertex. Thus, preferably, at least two vertices of the polygonal rear side are provided with a pin, preferably at the fixed distance from the vertex. In particular, at least three vertices are provided with it. In a very particular case, every vertex of the polygonal rear side is provided with a pin.

[0018] In an interesting manner, the polygonal rear side is divisible into identical equilateral triangles. Preferably, the rear side forms an equilateral triangle, a rhombus, or a regular hexagon.

[0019] Preferably, the building block forms a straight prism with a top surface, a bottom surface and the side surfaces, with the visible side forming the top surface and the rear side forming the bottom surface.

[0020] Preferably, the rear polygon is equilateral. Further, the side surfaces preferably have identical dimensions.

[0021] Possibly, the side surfaces have at least one tongue and/or one groove that work together to connect the side surfaces of the building blocks.

[0022] The rear side is preferably flat.

[0023] In a specific embodiment, the building block is manufactured by carbonation of carbonatable material originating, for example, from metal slag.

[0024] Preferably, the block is formed in a press, wherein the pin is partially embedded in the building block during pressing and wherein the building block provided with the pin is hardened by carbonation.

[0025] The free end of the pin may have a notch and/or a narrowing for, for example, a locking element such as a cotter pin, a locking pin, a locking clip, a locking ring, an axle locking ring, a fast lock, a circlip, a spring pin and/or a linchpin. The free end of the pin may have a bulge or a combination of a bulge with a notch and/or with a narrowing.

[0026] The coupling plate is preferably flat.

[0027] The recesses in the coupling plate or at least part thereof may be in a 36-fold, a 24-fold and/or a 12-fold rotational symmetry around the central point.

[0028] The coupling plate preferably includes a rosette pattern.

[0029] The mounting system may also include a wall tie designed to be anchored in the retaining wall at one end and attached to the coupling plate at another end.

[0030] Preferably, the wall tie has a longitudinal axis running through the central point of the coupling plate when the wall tie and the coupling plate are fixed to each other.

[0031] Preferably, the wall tie and the coupling plate can move in relation to each other when they are fixed to each other.

[0032] Thus, the end to be anchored in the retaining wall may be at an adjustable distance from the coupling plate.

[0033] The wall tie may possibly have an external thread that cooperates with an internal thread provided in the coupling plate.

[0034] Preferably, the wall tie includes a batter pin and/or a screw to be anchored in the retaining wall.

[0035] In a most interesting manner, the coupling plate is provided with guide slots extending into the recesses to receive the pins and guide them into these recesses.

[0036] The guide slots thereby possibly extend at a top side of the coupling plate between a top edge and the recess at this top side and/or at a bottom side of the coupling plate between a bottom edge and the recess at this bottom side.

[0037] The guide slots may further extend beyond the top edge at the top of the coupling plate into the recess at said top side and/or beyond the bottom edge of the coupling plate into the recess at said bottom side.

[0038] The coupling plate is preferably made in one piece. The coupling plate can possibly also be made in one piece with at least part of the wall tie.

[0039] The coupling plate may be provided with a guide

slot extending into a central recess to receive the wall tie and guide it into this recess. The coupling plate may be provided with flaps at the central recess and/or the guide slot.

[0040] The recess and preferably the guide slots may be narrower than a bulge at the free end of the pin.

[0041] Further, the recess for the pin in the coupling plate may have a diameter and/or a width, and preferably also the guide slot to this recess has a width which amounts to more than a diameter or a width of the pin at the level of a notch and/or a narrowing at the free end of the pin.

[0042] It is also possible that the recess for the pin in the coupling plate has a diameter and/or a width, and preferably also the guide slot to this recess has a width which amounts to less than a width and/or a diameter of a bulge at the free end of the pin.

[0043] Finally, the invention also relates to a method in which the building blocks are stacked on top of each other with their side surfaces, preferably dry-stacked, and in which adjoining building blocks are connected to each other by inserting the pins at the vertices of adjoining vertices of the adjoining building blocks on the rear side of these building blocks into the recesses of the coupling plate, as claimed in the claims appended hereto.

[0044] In an advantageous manner, the building blocks are connected by inserting the pins at a fixed distance from the vertex of adjoining vertices of the adjoining building blocks into the recesses of the coupling plate at a fixed distance from a central point of the coupling plate.

[0045] In a very advantageous manner, three, four, five or six pins are inserted per coupling plate according to this method.

[0046] In an extremely advantageous manner, the pins are locked in the coupling plates by inserting a locking element, such as a cotter pin, a locking pin, a locking clip, a locking ring, an axle locking ring, a fast lock, a circlip, a spring pin and/or a linchpin.

[0047] In an interesting manner, the building blocks are stacked on top of each other with their back sides facing the retaining wall, and wall ties fitted with the coupling plates are anchored in the retaining wall.

[0048] In a further interesting manner, the distance between the rear side of the building block and the retaining wall is controlled by moving the coupling plate in relation to the wall tie.

[0049] In a special manner, the coupling plate with guide slots extending on the bottom side is slid over the pins of adjacent vertices of a first group of building blocks, so that these pins are inserted in the recesses for these pins, after which the pins of a second group of building blocks which are applied on the first group of building blocks are inserted in the recesses for these pins via the guide slots on the top side of the coupling plate.

[0050] In a very particular manner, the coupling plate is attached to a wall tie by inserting one end of the wall tie into a guide slot in the coupling plate and by guiding this end in said guide slot from a bottom side towards a

top side into a central recess for the wall tie.

[0051] Other particularities and advantages of the invention will become clear from the following description of practical embodiments of the building block, mounting system and method according to the invention; this description is given as an example only and does not limit the scope of the claimed protection in any way.

Figure 1 is a view in perspective of a building block according to an embodiment of the invention with a rhombus-shaped rear side.

Figure 2 is a rear view of the rear side of the building block according to Figure 1.

Figure 3 is a rear view of possible variants of the rear side of the building block according to Figure 1.

Figure 4 is a front view of a possible stacking mode of building block according to Figures 1 to 3.

Figure 5 is a representation of possible patterns A to H with building blocks according to Figures 1 to 3.

Figure 6 is a representation of the rear side of a building block in the shape of an equilateral triangle.

Figure 7 is a representation of the rear side of a building block in the shape of three connecting equilateral triangles.

Figure 8 is a representation of the rear side of a building block in the shape of four connecting equilateral triangles.

Figure 9 is a view in perspective of a possible stacking method with a corner block.

Figure 10 is a representation of a possible method for manufacturing a corner block from Figure 9.

Figures 11, 12 and 13 are views in perspective of possible pins for a building block.

Figures 14, 15 and 16 are views in perspective of possible locking elements for the pins from Figures 11 and 12.

Figure 17 is a top view of a mounting system with building blocks and a retaining wall.

Figure 18 is a view in perspective of the rear side of a coupling plate of a mounting system wherein the coupling plate has twelve recesses.

Figure 19 is a view in perspective of the front side of the coupling plate according to Figure 18.

Figure 20 is a view in perspective of the coupling plate according to Figure 18 with a pin and a locking element.

Figure 21 is a view in perspective of the coupling plate according to Figure 19 with the pin and locking element according to Figure 20.

Figure 22 is a view in perspective of a coupling plate with twelve recesses in which guide slots are provided for the pins of the building blocks, wherein these guide slots are provided at the bottom of the recesses for the pins.

Figure 23 is a view in perspective of a coupling plate with twelve recesses wherein guide slots are provided for the pins of the building blocks, wherein, at the bottom, these guide slots are provided at the bottom

side of the recesses for the pins and wherein, at the top, these guide slots are provided at the top side of the recesses for the pins.

Figure 24 is a view in perspective of a coupling plate as shown in Figure 22 with two sequences of five recesses.

Figure 25 is a view in perspective of a coupling plate as in Figure 23 with two sequences of five recesses.

Figure 26 is a view in perspective of a coupling plate with twelve recesses in which guide slots are provided for the pins of the building blocks, wherein the guide slots extend beyond the outer edge of the coupling plate.

Figure 27 is a view in perspective of a coupling plate analogous to the coupling plate from Figure 26, wherein flaps are provided at the guide slot and the recess for the wall tie.

Figure 28 is a view in perspective of a coupling plate analogous to the coupling plate from Figure 27.

Figure 29 is a view in perspective of a coupling plate as shown in Figure 28 with two sequences of five recesses and guide slots extending beyond the outer edge of the coupling plate.

[0052] The invention generally relates to a facade and a facade system with building blocks and a mounting system for building a facade, as well as a method for doing so.

[0053] The building blocks are designed to be dry-stacked on top of each other and attached to each other and/or to a retaining wall by means of the mounting system.

[0054] To this end, the building blocks are provided with a pin at the rear at one or several angles, working together with a coupling plate of the mounting system to fix the pin in. Thus, several pins of adjacent angles of different building blocks are fixed in the coupling plate to connect these angles. The coupling plate is provided with recesses for the pins.

[0055] The coupling plate may be fixed to the retaining wall using a wall tie. To this end, the wall tie is anchored in the retaining wall.

[0056] According to an embodiment of the claimed invention, shown in Figures 1, 2 and 3, this building block 1 is essentially a straight prism with identical side surfaces 4 between a top surface and a bottom surface. As these side surfaces 4 have identical dimensions, the side surfaces 4 of the different building blocks 1 fit together. The top surface forms a visible side 2. The bottom surface forms a rear side 3 with a rhombus shape. The visible side 2 may possibly have an uneven or finished surface, mainly depending on the intended aesthetic effect. The rear face 3 is preferably mainly flat, but may possibly also be provided with bumps, recesses and/or raised parts. The rear face 3 is further provided with pins 5 at the vertices 9 of the rhombus, preferably at a fixed distance 8 from these vertices 9. Preferably, each of the vertices 9 is provided with a pin 5.

[0057] The fixed distance 8 may be, for example, 40 mm, but it may of course be selected larger or smaller.

[0058] In this embodiment, shown in Figures 1 to 3, the size of the angles 6 of the rhombus is 120° , while the size of the adjacent angles 7 of this rhombus is 60° .

[0059] According to this embodiment, a pin 5 may be provided on a line 11 passing through the vertex 9 and forming a partial angle 12 with a leg of the angle 6 or 7.

[0060] The partial angle 12 is, for example, possibly 10° or a multiple of 10° . It may also be 15° or a multiple of 15° . Preferably, the partial angle is 30° or a multiple of 30° .

[0061] In this embodiment, when for the angle 6 the partial angle is 60° , then the line 11 will correspond to the bisector 10 of this angle 6. Further, when the partial angle is 30° for the adjacent angle 7, the line 11 will correspond to the bisector 10 of this angle 7.

[0062] If in this embodiment the partial angle is 120° for the angle 6, then the line 11 will correspond to a leg of this angle 6. If the partial angle is 60° for the angle 7, then the line 11 will correspond to a leg of this angle 7 and the pin 5 will be provided on this leg, as shown in Figure 3.

[0063] Preferably, the pins 5 are provided on the bisectors 10 of the angles 6 and 7 at a fixed distance 8 from the vertices 9, as shown in Figure 2.

[0064] The building blocks 1 are preferably identical to each other.

[0065] Because of the identical side surfaces 4 and the specifically selected angles 6 and 7 with a size that is 60° and 120° respectively, the building blocks 1 of this embodiment can be stacked in different patterns with the side surfaces 4 fitting on top of each other. Preferably, the building blocks fit together completely in this pattern, so that the pattern is completely occluded. Figures 4 and 5 show some of these possible patterns. In this case, 3 to 6 vertices 9 of different building blocks 1 preferably fit together. In an incomplete pattern or a pattern in which blocks 1 are omitted, there could, for example, also be only 1 or 2 vertices 9. The pattern from Figure 4 shows three adjacent vertices 9 of three different adjacent building blocks 1. The vertices 9 are slightly rounded here. Furthermore, the adjacent vertex 9 of the upper layer of building blocks 1 is slightly shifted to the left compared to the adjacent vertices 9 of the underlying building blocks 1.

[0066] Obviously, according to variants of this embodiment, the building blocks 1 may also have other shapes or combinations of shapes, and the pattern may be supplemented or composed therewith. For example, the top and bottom surfaces of the block 1 may form an equilateral triangle or a regular hexagon, or they may form a combination of connected equilateral triangles as shown, for example, in Figures 6, 7 and 8. Preferably, these are identical triangles with one common side, two by two. Thus, in these blocks 1, the polygonal rear side 3 is divisible into identical equilateral triangles.

[0067] Furthermore, corner blocks 15 may possibly be

provided, as shown for this embodiment in Figures 9 and 10. As shown in Figure 10, two building blocks 1 may be sawn for this purpose, so that two parts 13 and 14 are obtained which may be glued together with their sawing surfaces.

[0068] Figures 11, 12 and 13 show possible embodiments of pins 5. The pins 5 are provided with a part 16 that is embedded in the building block 1 and a free end 17 that should extend at the rear 3, outside the building block 1. The embedded part 16 may be provided with wings 48 to hold this part in the building block 1. The free end 17 is provided to be fixed in a coupling plate 20 of a mounting system, as shown, for example, in Figures 17 to 29.

[0069] The coupling plate 20 is preferably flat and provided with recesses 25 for receiving and fixing the free ends 17 of the pins 5 of adjacent vertices 9 of different adjacent building blocks 1 in. The recesses 25 hereby preferably extend in the same plane. The pins 5 may thus extend into and/or through the recesses 25, thus connecting the vertices 9 of the building blocks 1. According to this embodiment, two to six vertices 9 can be involved.

[0070] The recesses 25 are provided at a fixed distance 32 from a central point 31. Preferably, at least twelve recesses 25 are provided in a twelve-fold rotational symmetry around an axis 33 through the central point 31. The central point 31 in this case forms a rotational point situated in the same plane as the recesses 25. The axis 33 is perpendicular to this plane. The distance 32 between the recesses 25 and the central point 31 and/or the axis 33 is greater than or equal to the distance 8 between the vertices 9 and the pins 5 in this case. When these distances 8 and 32 are equal, the vertices 9 of the adjacent building blocks 1 fit together. Alternatively, these vertices 9 may also be slightly removed from each other, so that the distance 32 between the recess 25 and the central point 31 is greater than the distance 8 between the vertex 9 and the pin 5. This may be the case when, for example, the vertices 9 are rounded. This may also be the case when, for example, the side faces 4 of the building blocks 1 are provided with upright spacers, not shown in the figures, with which these side faces 4 are stacked on each other and/or support each other.

[0071] In this twelve-fold rotational symmetry, the successive recesses 25 are at a rotation angle 49 of 30° relative to each other, as shown in Figures 18 to 23 and 26 to 28. Thus, the coupling plate 20 may have a rosette shape. Additional recesses 25 may possibly be provided. Possible variants of this coupling plate 20 may, for example, also include 24 recesses in a 24-fold rotational symmetry or 36 recesses in a 36-fold rotational symmetry, not shown in the figures. In said 24-fold rotational symmetry, successive recesses are then at a rotation angle of 15° to each other, while in the 36-fold rotational symmetry, successive recesses are at a rotation angle of 10° to each other. The size and position of the recesses 25 of the coupling plate 20 and the pins 5 are of course adapted to each other.

[0072] According to other embodiments of the coupling plate 20, as shown in Figures 24, 25 and 29, only at least ten recesses 25 are provided instead of the twelve recesses 25 described above. In this case, two sequences of five recesses 25 are arranged in a twofold rotational symmetry around the central point 31 with each of the recesses 25 at the distance 32 from this point 31. It concerns a first series of five adjacent recesses 25 situated symmetrically on the coupling plate 20 with respect to a second series of five recesses 25. This coupling plate 20 allows, for example, to form the various patterns shown in Figures 4 and 5 with building blocks 1 whose rear side forms a rhombus with angles 6 and 7 of 120° and 60°. The pins 5 may be provided on the bisectors of the angles 6 and 7.

[0073] The recesses 25 are preferably circular. However, it is also possible for these recesses 25 to take other shapes, such as, for example, oval, square or rectangular, not shown in the figures. As a result, only part of the recess 25 may possibly exhibit the rotational symmetry described above.

[0074] The free end 17 of the pin 5 may have a notch 18 for a locking element 19, such as a cotter pin, a locking pin, a locking clip, a locking ring, an axle locking ring, a circlip, a spring pin and/or a linchpin. The locking element 19 ensures that the pin 5 that is inserted in the recess 25 is locked therein, so that the coupling plate 20 and the pin 5 are fixed to each other. Figures 14 and 15 show possible locking elements 19 consisting of matching retaining rings. Figure 16 shows another possible locking element 19 consisting of a retaining ring 23 with an auxiliary lever 24 attached to it. A retaining ring, or so-called starlock, having at least one internal flap, rib and/or tooth that can engage the pin 5 may also form a suitable locking element 19. A notch 18 may either not be provided and/or be required in this case.

[0075] The pin 5 may also be provided with a bulge 46, as shown in Figure 13. Here, the bulge 46 forms, for example, a tooth at the free end 17 of the pin 5 that engages in or behind the recess 25 in the coupling plate 20. A separate locking element 19 may then be redundant.

[0076] A flange 47 may also be provided to possibly support the coupling plate 20. The coupling plate 20 with the recess 25 can then be placed between the flange 47 and the bulge 46.

[0077] The mounting system may further include wall ties 21 for attaching the coupling plates 20 and, consequently, also the building blocks 1 to a rear retaining wall 22.

[0078] To this end, the wall tie 21 is anchored in the retaining wall 22 by a first end 26. Preferably, the wall tie 21 comprises a batter pin 28 and/or a screw, which are known as such to anchor the wall tie 21 in, for example, a drill hole in the retaining wall 22.

[0079] At a second end 27 of the wall tie 21, the coupling plate 20 can be attached to said wall tie 21, preferably transversely to the wall tie 21. The coupling plate 20

is thus fixed to the retaining wall 22 via this wall tie 21. Not every coupling plate 20 must be anchored in this manner in the retaining wall 22. Consequently, not every coupling plate 20 must be provided with a wall tie 21. For example, five wall ties 21 may be provided per m² of stacked building blocks 1, while more than five coupling plates 20 are provided per m² to connect the building blocks 1 via the angles 9. As a result, the coupling plates 20 must not necessarily be provided to attach a wall tie 21 to.

[0080] The wall ties 21 may be provided with an external thread 34 at the second end 27, cooperating with an internal thread 30 and which may be provided in a central recess 29 in the coupling plate 20, as shown in Figures 17 to 21. This may also allow for another position of the coupling plate 20 on the wall tie 21. Thus, the distance between the coupling plate 20 and the end 26 of the wall tie 21 and therefore also the distance 35 between the coupling plate 20 and the retaining wall 22 can be adjusted. The central recess 29 is preferably provided in and around the central point 31. Thus, the recesses 25 and the wall tie 21 preferably have the same axis 33. Optionally, the central recess 29 for the wall tie 21 may be placed off centre. Multiple recesses 29 for one or several wall ties 21 may also be provided in this way.

[0081] In other examples of the coupling plate 20, shown in Figures 22 to 29, this coupling plate 20 is provided with guide slots 36 and/or 37 for the pins 5 up into the recesses 25. The guide slots 36 and 37 preferably connect the outer edge 44 or 45 of the coupling plate 20 to the recess 25, as shown in Figures 26 to 29. However, it is also possible that the guide slots 36 and 37 do not extend to the outer edges 44 or 45 of the coupling plate 20, as shown in Figures 22 to 25.

[0082] The pins 5 and locking elements 19, as shown in Figures 11, 12 and 14 to 16, may possibly also be used together with the latter coupling plates 20 from Figures 22 to 29.

[0083] However, pins 5 that fit in the guide slots 36 and 37 and recesses 25 and that have a bulge 46 at their free end 17 are preferably used for this purpose. They have the advantage that, preferably, a separate locking element 19 is not necessary. The bulge 46 is in this case wider than the recesses 25 and, preferably, also wider than the guide slots 36 and 37, so that the pins 5 with the bulge 46 can engage behind the coupling plate 20 and the coupling plate 20 is thereby situated between the bulge 46 and the building block 1. In the case of the coupling plate 20 as shown in Figures 22 to 25, for example, the bulge 46 is preferably not wider than the guide slots 36 and 37.

[0084] The pin 5, as shown in Figure 13, has, for example, a bulge 46 and a flange 47. The portion of the pin 5 between the bulge 46 and the flange 47 can be inserted into the guide slots 36 and 37 and guided into the recess 25. The bulge 46 and/or the flange 47 may possibly extend along the entire circumference of the pin 5.

[0085] Another example of a possible embodiment of

a suitable pin 5, not shown in the figures, includes a screw or a bolt in which the threaded end 16 is to be embedded in the building block 1. The screw thread forms wings 48 in this case to retain said part 16 in the building block 1. The head of the screw or bolt further forms a bulge 46 at the free end 17 of the pin 5.

[0086] Yet another possible example of a suitable pin 5, not shown in the figures, has a narrowing or notch at its free end 17 that fits into the guide slots 36 and 37 and the recess 25, while the pin 5 before and after this narrowing or notch is wider than the recess 25 and possibly also wider than the guide slots 36 and 37. The narrowing or notch may preferably extend along the entire circumference of the pin 5.

[0087] Preferably, the pins 5 are generally cylindrical, but they may also be naturally beam-shaped or have other shapes. Similarly, the recesses 25 are also, preferably, circular in shape, and they may also be rectangular or have other suitable shapes.

[0088] The coupling plate 20 preferably has a top side 42 with the top edge 44 and a bottom side 43 with the bottom edge 45, as shown in Figures 22 to 29. The guide slots 36 of the recesses 25 on the top side 42 may extend towards the top edge 44, as shown in Figures 23 and 25 to 29. The guide slots 37 of the recesses 25 at the bottom side 43 may extend towards the bottom edge 45, as shown in Figures 22 to 29. For the coupling plate 20 shown in Figures 22 and 24, the guide slots 36 of the recesses 25 on the top side 42 also extend towards the bottom edge 45, as do the guide slots 36 on the bottom side 43. The guide slots 36 and 37 may extend beyond the top edge 44, the bottom edge 45 respectively, as shown in Figures 26 to 29. Further, the guide slots 36 on the top side 42 preferably extend parallel to each other, and likewise the guide slots 37 on the bottom side 43 preferably extend parallel to each other. Preferably, the guide slots 36 are also parallel to the guide slots 37.

[0089] The guide slots 36 and/or 37 may be provided with at least one tooth, not shown in the figures, which acts as a barb and prevents the pin 5 from being removed from the recess 25 and/or from the guide slot 36 and/or 37 after it has been inserted in the recess 25.

[0090] The central recess 29 is preferably provided in and/or around the central point 31 and allows the coupling plate 20 to be attached to the second end 27 of the wall tie 21. To this end, a guide slot 38 is provided, for example, which can receive the end 27 of the wall tie and guide it towards the top side 42 into the central recess 29. The guide slot 38 may be provided with at least one tooth, not shown in the figures, which acts as a barb and prevents the end 27 of the wall tie 21 from being removed from the recess 29 and/or the guide slot 38 after it has been inserted in the recess 29.

[0091] The guide slot 38 for the wall tie 21 may be provided with one or more flaps 39 on either side. Furthermore, the recess 29 may be provided with at least one flap 40.

[0092] The coupling plate 20 can thus be hooked with

the flap 40 over the end 27 of the wall tie 21. For this purpose, the end 27 is preferably provided with a bulge, such as for example a screw head, which can be clamped between the coupling plate 20 and the flap 40. The flaps 39 of the guide slot 38 thereby also guide the bulge of the end 27 of the wall tie 21.

[0093] The coupling plate 20 may be manufactured from a plastic or a metal flat plate, for example by stamping and/or punching, which are methods known as such to those skilled in the art.

[0094] The building block 1 is advantageously manufactured by carbonation of a carbonatable material that may, for example, be derived from metal slag or also granulated blast furnace slag. Such fabrication methods are known as such to those skilled in the art. Among other things, they offer the advantage that the building blocks can be manufactured with very high dimensional stability. The building block 1 is formed in a press, and preferably the pin 5 is partly embedded in the building block 1 during pressing. Thus, the building block 1, which is provided with the pin 5, is hardened by carbonation. Of course, it is also possible to insert the pins 5 in the building block 1 only after the pressing or hardening. To that end, drill holes can be made in the building block 1, for example. It is also possible to provide fastenings in the building block 1 in which the pins 5 can be fixed. These fastenings may include, for example, a screw thread, a turning system and/or a click system, not shown in the figures.

[0095] The building blocks 1 may of course also be manufactured from fired clay or concrete.

[0096] In another embodiment of the invention, not shown in the figures, the building blocks comprise a combination of one or several blocks whose polygonal rear side has the shape of a regular hexagon, a regular triangle, a regular quadrilateral, a regular dodecagon and/or a rhombus whose angles are 120° and 60° and/or a rhombus whose angles are 150° and 30°. Preferably, the sides of these polygons have equal lengths. The successive recesses for said pins in the coupling plate may, for example, be provided at the fixed distance around the central point at a rotation angle of 15° or 30° relative to each other. The same coupling plate can be provided for different stacking patterns.

[0097] In yet another embodiment of the invention, not shown in the figures, the building blocks comprise a combination of one or several blocks whose polygonal rear side has the shape of a regular octagon, a regular quadrangle and/or a rhombus whose angles are 135° and 45°. The sides of these polygons preferably have equal lengths. In this embodiment, the pins may be provided on a line passing through the vertex and forming a partial angle with a leg of the angle that is, for example, 15° or 30°. The successive recesses for these pins in the coupling plate can then, for example, be provided at the fixed distance around the central point at a rotation angle of 15° relative to each other.

[0098] According to a possible method of the invention, a facade is manufactured by stacking building blocks 1

as described above, for example, and connecting them to each other by means of a mounting system, also as described above, for example.

[0099] The building blocks 1 are thus stacked on top of each other with the side surfaces 4, preferably dry-stacked, and connected to each other by inserting the pins 5 at the vertices 9 of the adjacent vertices 9 of the building blocks 1 on the rear side 3 of these building blocks 1 in the recesses 25 of the coupling plates 20. Thus, for example, three, four, five and/or six pins 5 per coupling plate 20 are inserted into the recesses 25.

[0100] The pins 5 may be locked in the recesses 25 of the coupling plates 20 by inserting a locking element 19, such as, for example, cotter pin, a locking pin, a locking clip, a locking ring, an axle locking ring, a fast lock, a circlip, a spring pin and/or a linchpin.

[0101] Preferably, the stacked building blocks 1 are turned with the rear side 3 towards a retaining wall 22 and attached thereto. To this end, wall ties 21 may be anchored in the retaining wall 22 and may be provided with coupling plates 20, which may be attached to the pins 5 of the building blocks 1. The building blocks 1 are thus attached to the retaining wall 22 via the pins 5, coupling plates 20 and wall ties 21.

[0102] The distance between the rear side 3 of the building block 1 and the retaining wall 22 can be adjusted, for example, by moving the coupling plate 20 in relation to the wall tie 21. To this end, a threaded connection may possibly be provided between the coupling plate 20 and the wall tie 21.

[0103] If the recesses 25 extending on the bottom side 43 of the coupling plate 20 are provided with guide slots 36 for the pins 5 of the building blocks 1, then this coupling plate 20 can easily slide over the pins 5 of adjacent vertices 9 of a first group of building blocks 1, so that these pins 5 can engage in the recesses 25.

[0104] If also the recesses 25 extending on the top side 42 of the coupling plate 20 are provided with guide slots 37 for the pins 5 of the building blocks 1, then the pins 5 of a second group of building blocks 1 that are placed on the first group of building blocks 1 can further be inserted in the recesses 25 via these guide slots 37.

[0105] The coupling plate 20 may be attached to a wall tie 21, for example, by inserting one end 41 of the wall tie 21 into a guide slot 38 and by guiding it in the guide slot 38 from the bottom side 43 to the top side 42 up into a central recess 29.

[0106] The invention is by no means limited to the embodiments, building blocks and mounting systems described above. Different elements from the embodiments and methods described above can be combined with each other.

[0107] For example, not every coupling plate is necessarily provided with a wall tie. Depending on the size and weight of the building block, also coupling plates can be provided that connect the angles of the blocks without these coupling plates being attached to the retaining wall, for example.

[0108] Thus, not all vertices of the building block are necessarily provided with a pin. Similarly, several pins may be provided at a vertex.

[0109] Thus, the side surfaces of the building blocks are not necessarily flat. The side surfaces can be provided with fitting profiles.

[0110] Thus, the building blocks can be provided with concave and/or convex side surfaces that fit on or into each other when stacked.

[0111] Thus, the rear side of the building blocks can be provided with recesses into which pins can be inserted, using, for example, a click system and/or a screw system.

[0112] Thus, the building blocks in the facade system are not necessarily all identical, but different shapes can be combined.

[0113] Thus, the guide slots and/or the recesses for the pins may be provided with flaps analogous to these at the guide slot and recess for the wall tie of the coupling plate shown in Figures 24 and 25. The guide slot for the wall tie may extend beyond the outer edge of the coupling plate.

[0114] Similarly, only some of the recesses for the pins in the coupling plate may be provided with a guide slot. It may be provided at the bottom side only or at the top side only of the coupling plate. Thus, various recesses, either or not with guide slots from Figures 18 to 26, may be combined in the coupling plate.

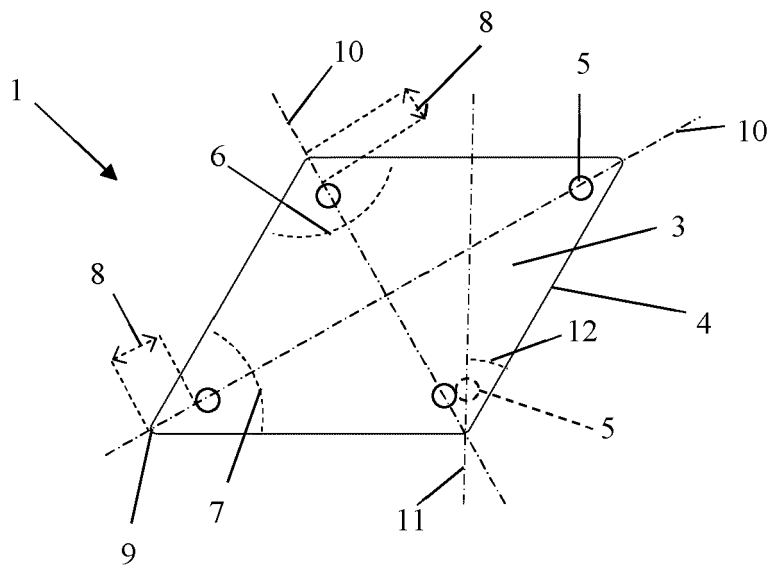
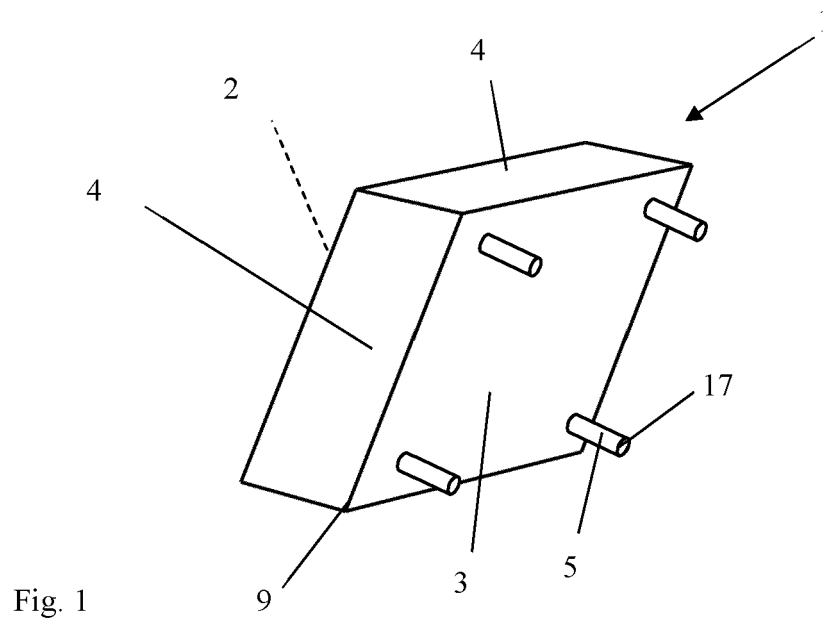
[0115] Thus, the recesses for the pins and/or for the wall tie can be provided on the coupling plate by forming a cavity on this coupling plate. To this end, flaps can be folded from a flat plate to form a cavity in which the end of a pin or of a wall tie can be inserted, for example.

Claims

1. Set of building blocks and a mounting system for manufacturing a facade with, preferably, dry-stacked building blocks,

wherein the building blocks (1) have a visible side (2) designed to be faced away from a retaining wall (22), a rear side (3) that forms a polygon and is designed to be faced towards the retaining wall (22), and side surfaces (4) that are situated between the visible side (2) and the rear side (3) and that are designed to allow the building blocks (1) to rest on each other, wherein a vertex (9) of an angle (6, 7) of the polygon is provided with a mounting pin (5) at a fixed distance (8) from this vertex (9) extending through the rear side (3) with a free end (17) beyond the building block (1), wherein the mounting system comprises a coupling plate (20) that is provided with recesses (25) for receiving and fixing the pins (5) of adjacent vertices (9) of different adjacent building

- blocks (1) in order to connect these vertices (9) to each other via the coupling plate (20), **characterised in that** successive recesses (25) are situated at a fixed distance (32) around a central point (31) at a rotation angle (49) with respect to each other that amounts to 10° to 30°, preferably 15° or 30°.
2. Set according to claim 1, wherein two sequences of five recesses (25) are situated in a twofold rotational symmetry around the central point (31).
 3. Set according to claim 1 or 2, wherein twelve recesses (25) are situated in a twelve-fold rotational symmetry around the central point (31).
 4. Set according to any one of claims 1 to 3, wherein the angle (6, 7) of the polygon has a size that is a multiple of 15°, in particular a multiple of 30°.
 5. Set according to any one of claims 1 to 4, wherein the angle (6, 7) of the polygon has a size different from 90°.
 6. Set according to any one of claims 1 to 5, wherein the angle (6, 7) of the polygon has a size that is 60° or 120°.
 7. Set according to any one of claims 1 to 6, wherein the pin (5) is provided on a line (11) passing through the vertex (9) and forming a partial angle (12) with one leg of the angle (6, 7) which (i) amounts to 10° or a multiple of 10°, or which (ii) amounts to 15° or a multiple of 15°, or which (iii) amounts to 30° or a multiple of 30°.
 8. Set according to any one of claims 1 to 7, wherein the pin (5) is provided on the bisector (10) of the angle (6, 7).
 9. Set according to any one of claims 1 to 8, wherein the polygonal rear side (3) is divisible into identical equilateral triangles; and/or wherein the rear side (3) forms an equilateral triangle, a rhombus, or a regular hexagon.
 10. Set according to any one of claims 1 to 9, wherein the polygon is equilateral, and wherein the side surfaces (4) preferably have identical dimensions.
 11. Set according to any one of claims 1 to 10, wherein it comprises a wall tie (21), wherein the wall tie (21) is designed to be anchored in the retaining wall (22) with one end (26) and to be attached to the coupling plate (20) with another end (27).
 12. Set according to any one of claims 1 to 11, wherein the coupling plate (20) is provided with guide slots (36, 37) extending into the recesses (25) to receive the pins (5) in and to guide them to said recesses (25).
 13. Set according to claim 12, wherein the guide slots (36, 37) extend at a top side (42) of the coupling plate (20) between a top edge (44) and the recess (25) at this top side (42) and/or at a bottom side (43) of the coupling plate (20) between a bottom edge (45) and the recess (25) at this bottom side (43).
 14. Set according to claim 13, wherein the guide slots (36, 37) extend beyond the top edge (44) on the top side (42) of the coupling plate (20) into the recess (25) at this top side (42) and/or beyond the bottom edge (45) on the bottom side (43) of the coupling plate (20) into the recess (25) at this bottom side (43).
 15. Method for manufacturing a facade with a set according to any one of claims 1 to 14, wherein the building blocks (1) are stacked with the side surfaces (4) on top of each other, preferably dry-stacked, **characterised in that** adjacent building blocks (1) are connected to each other by inserting the pins (5) at the vertices (9) of adjacent vertices (9) of the adjacent building blocks (1) on the rear side (3) of these building blocks (1) in the recesses (25) of the coupling plate (20); wherein, preferably, three, four, five or six pins (5) are inserted in the recesses (25) of the coupling plate (20); wherein furthermore, preferably, the coupling plate (20) with guide slots (36) extending at a bottom side (43) is slid over the pins (5) of adjacent vertices (9) of a first group of building blocks (1), so that these pins (5) are inserted in the recesses (25), after which the pins (5) of a second group of building blocks (1) which are installed on the first group of building blocks (1) are inserted in the recesses (25) via the guide slots (37) at a top side (42) of the coupling plate (20).



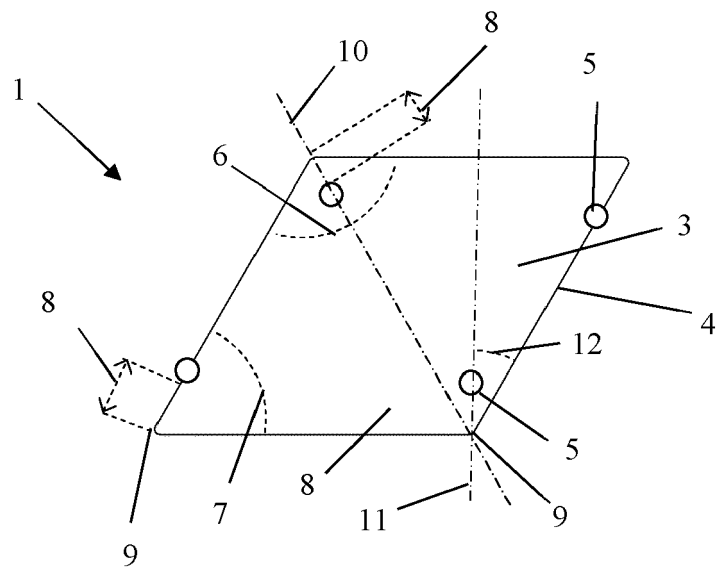


Fig. 3

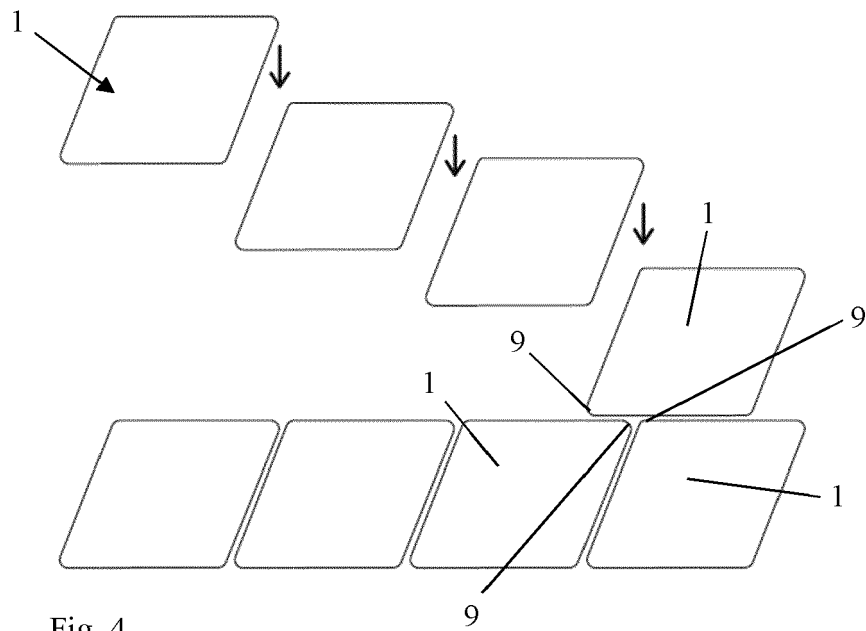


Fig. 4

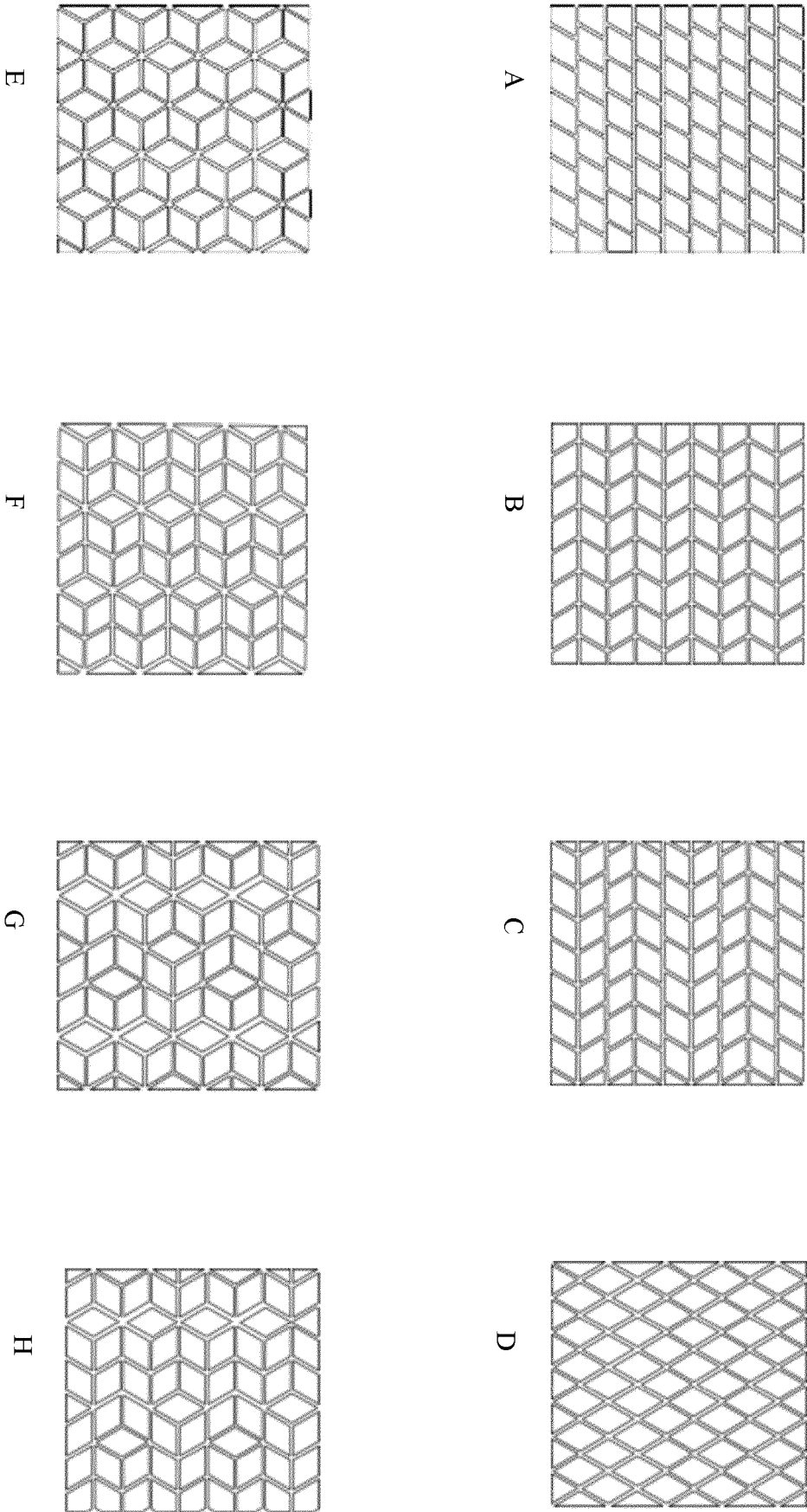


Fig. 5

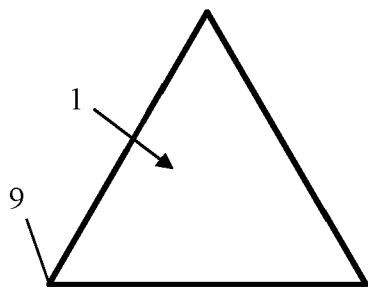


Fig. 6

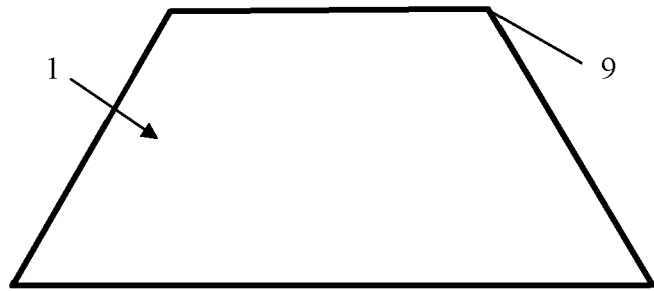


Fig. 7

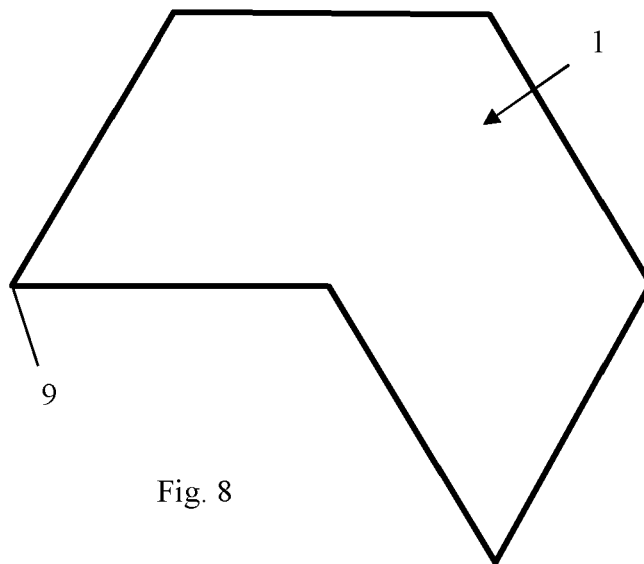


Fig. 8

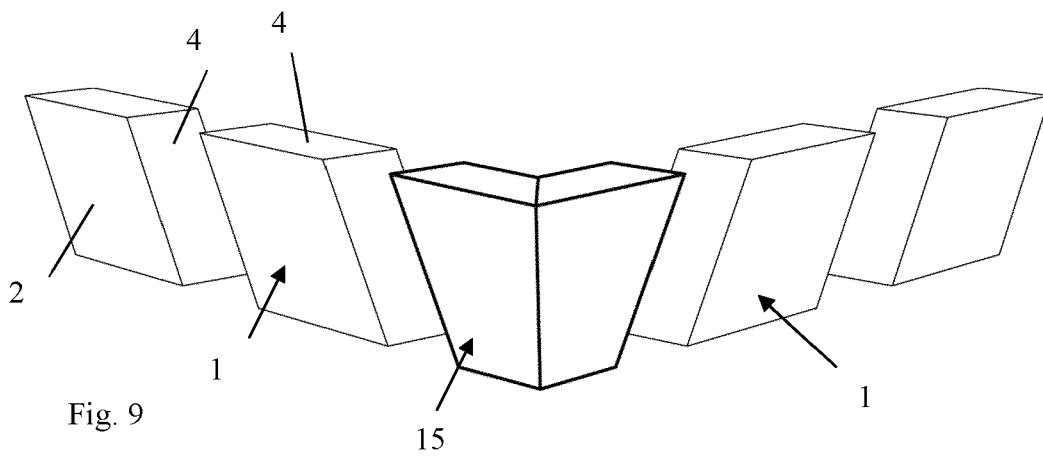


Fig. 9

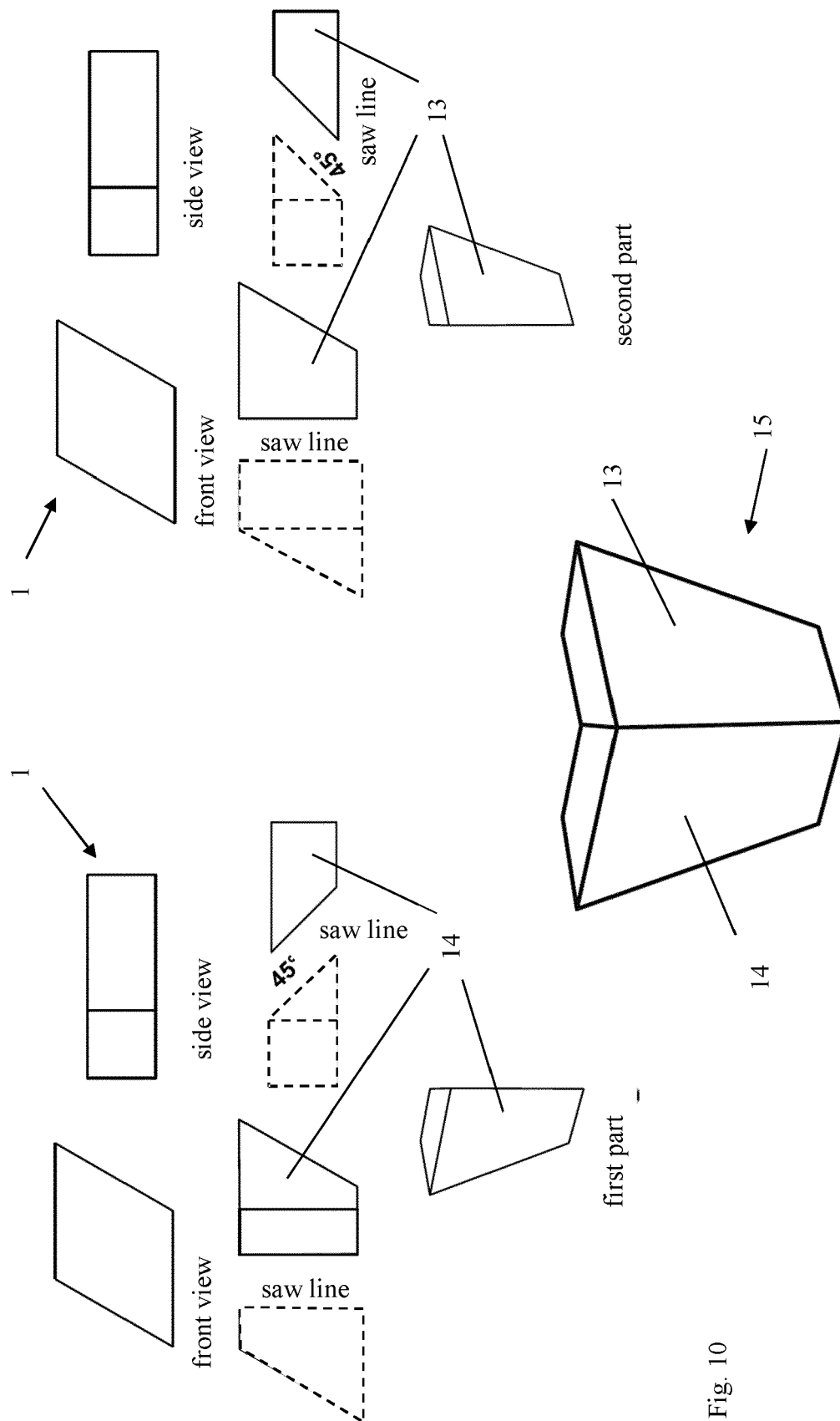
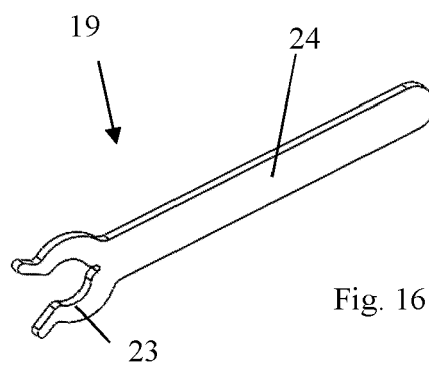
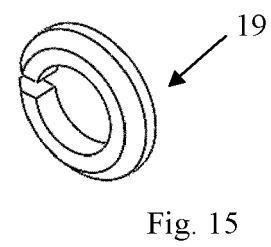
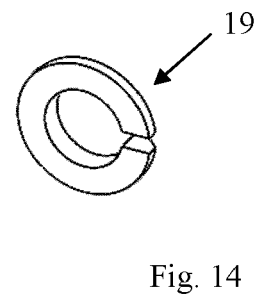
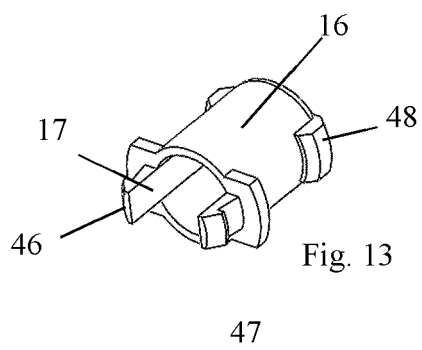
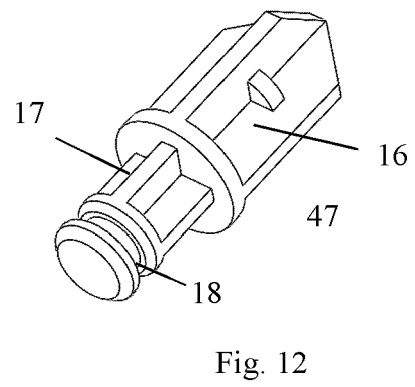
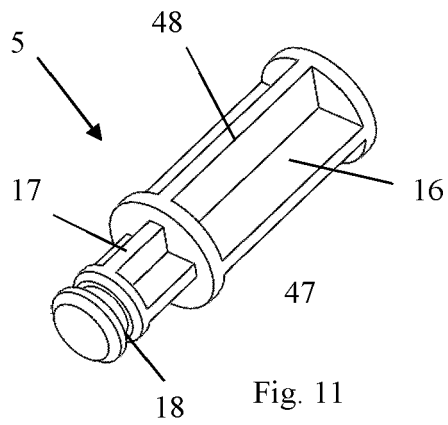


Fig. 10



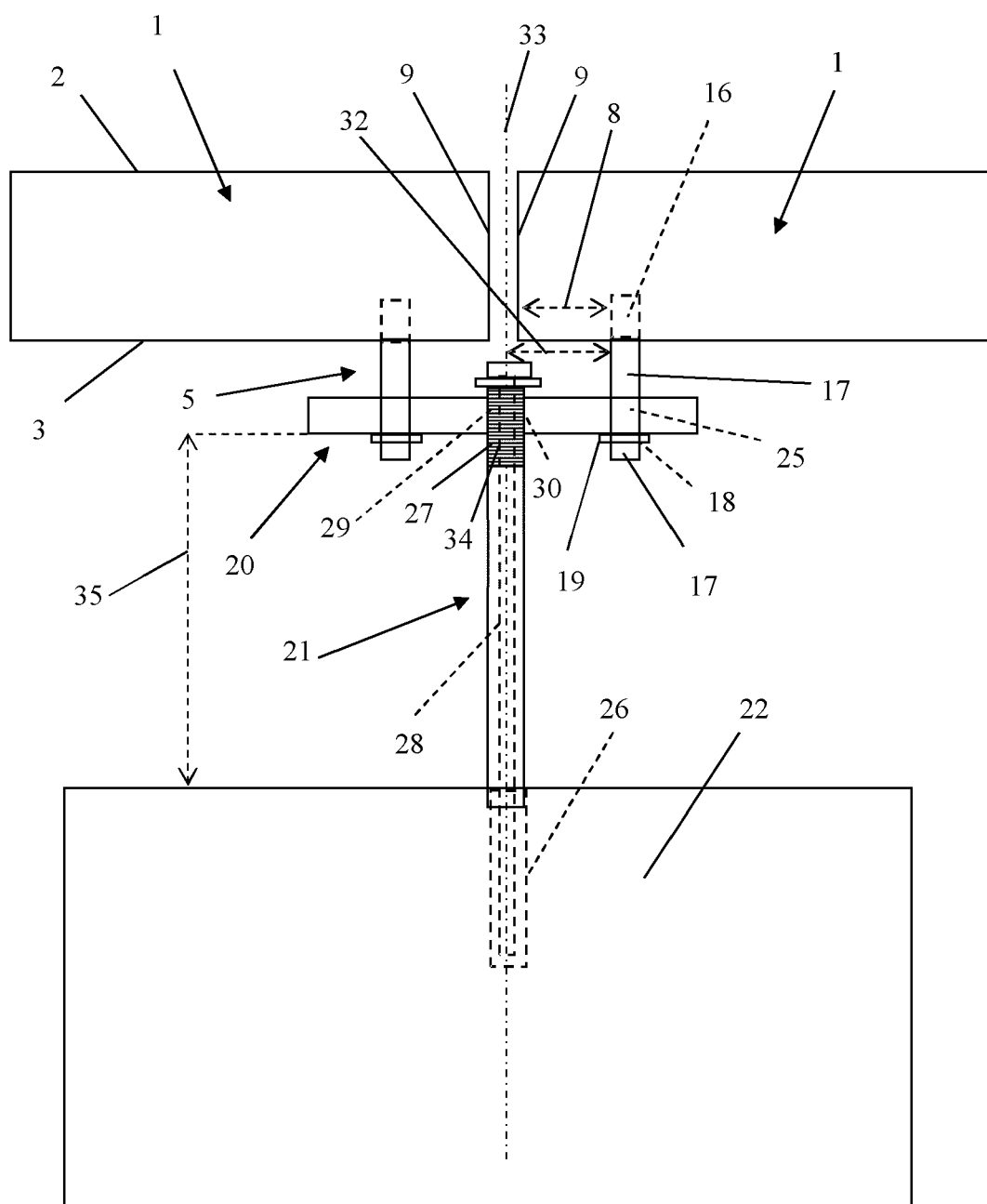


Fig. 17

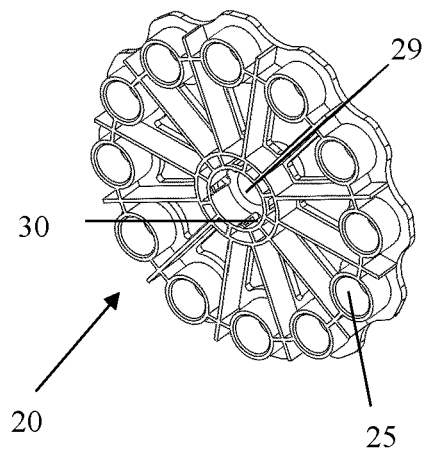


Fig. 18

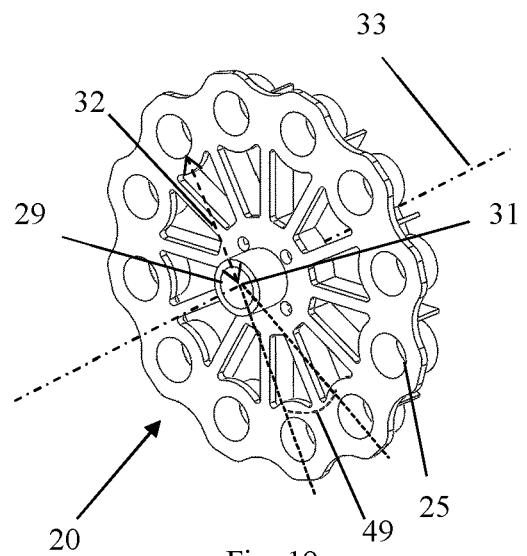


Fig. 19

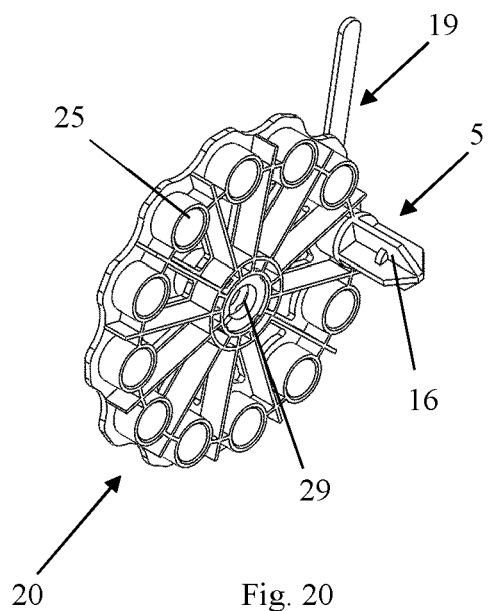


Fig. 20

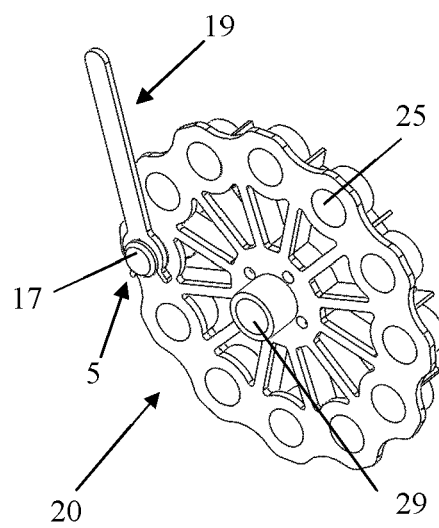
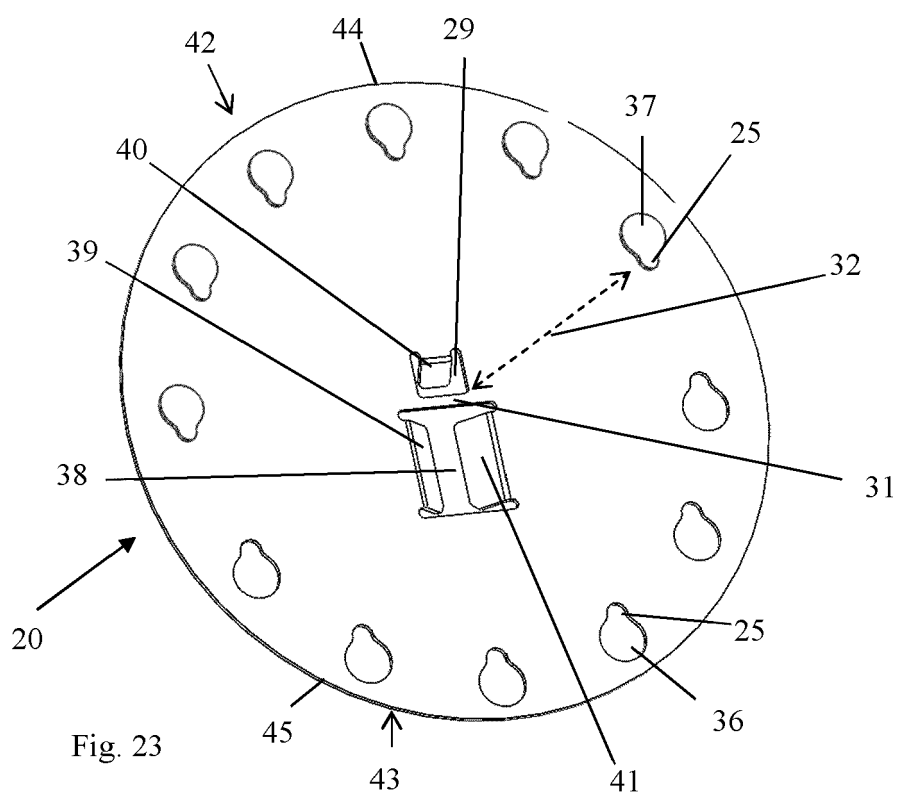
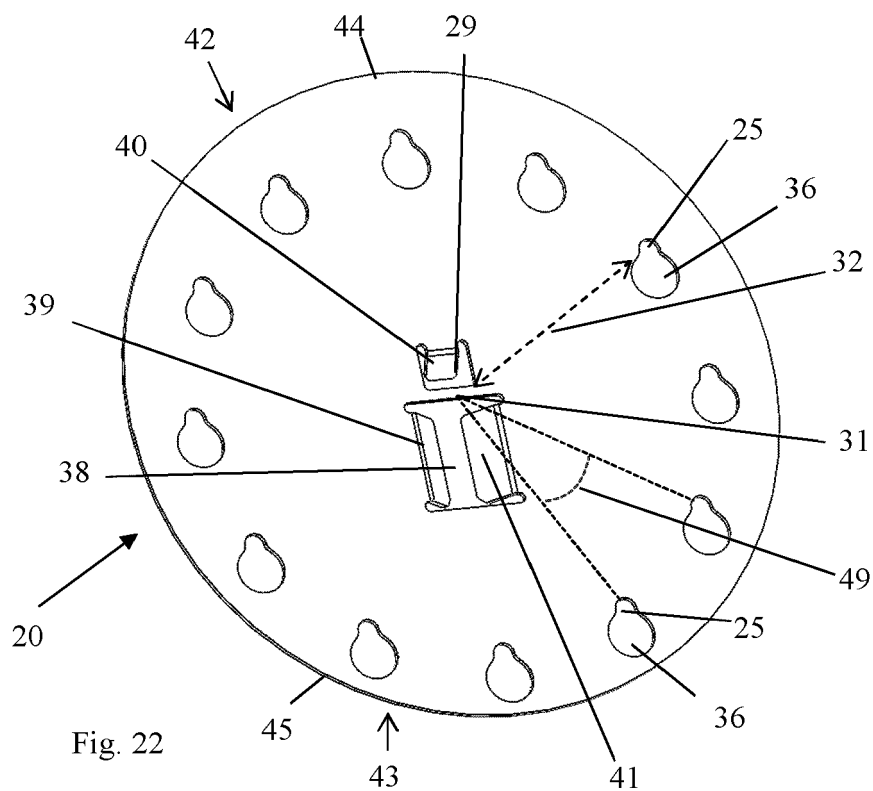
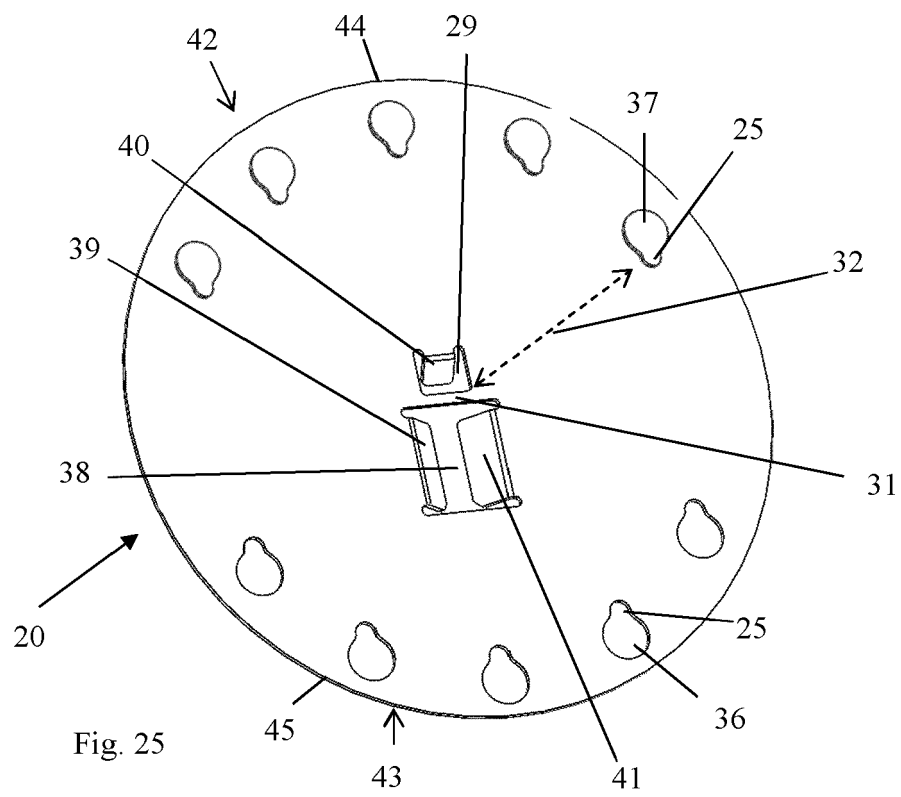
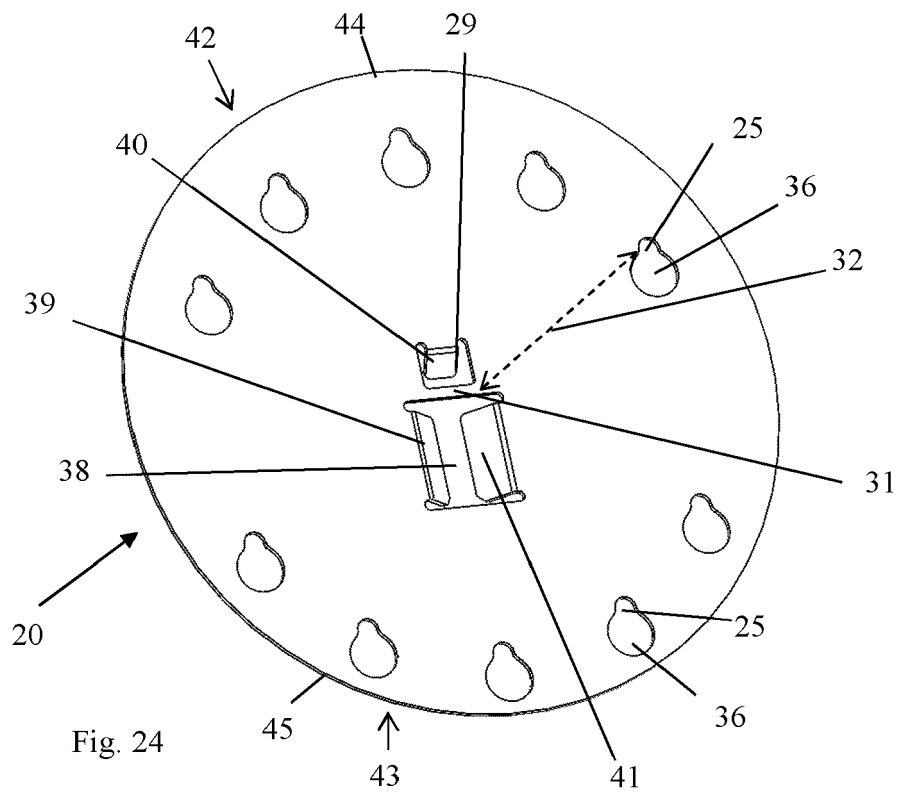
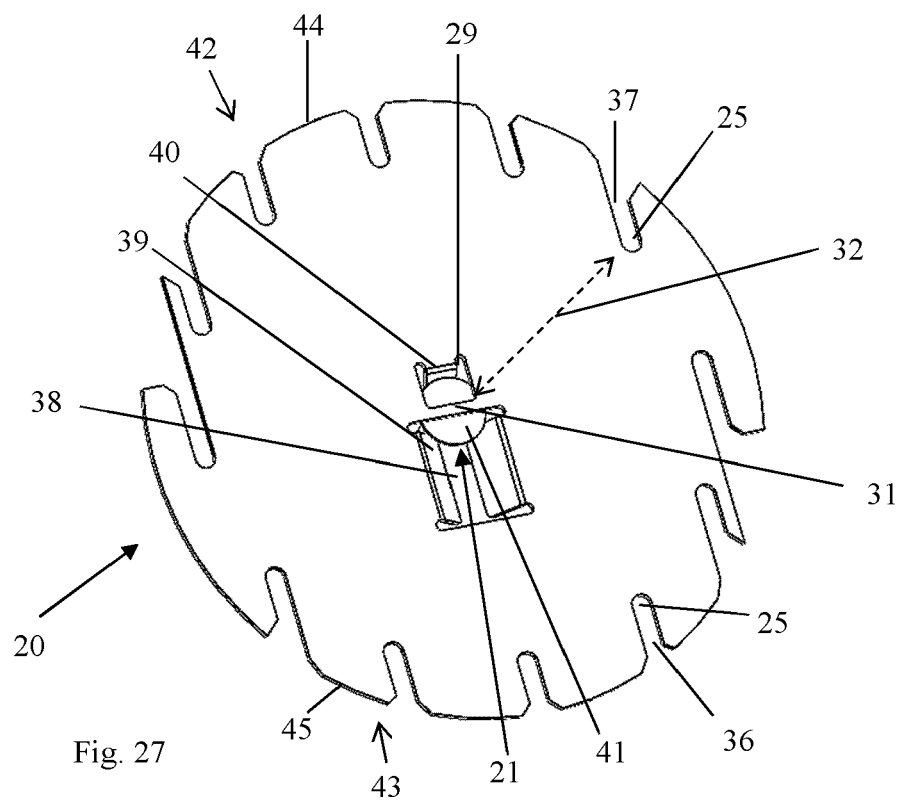
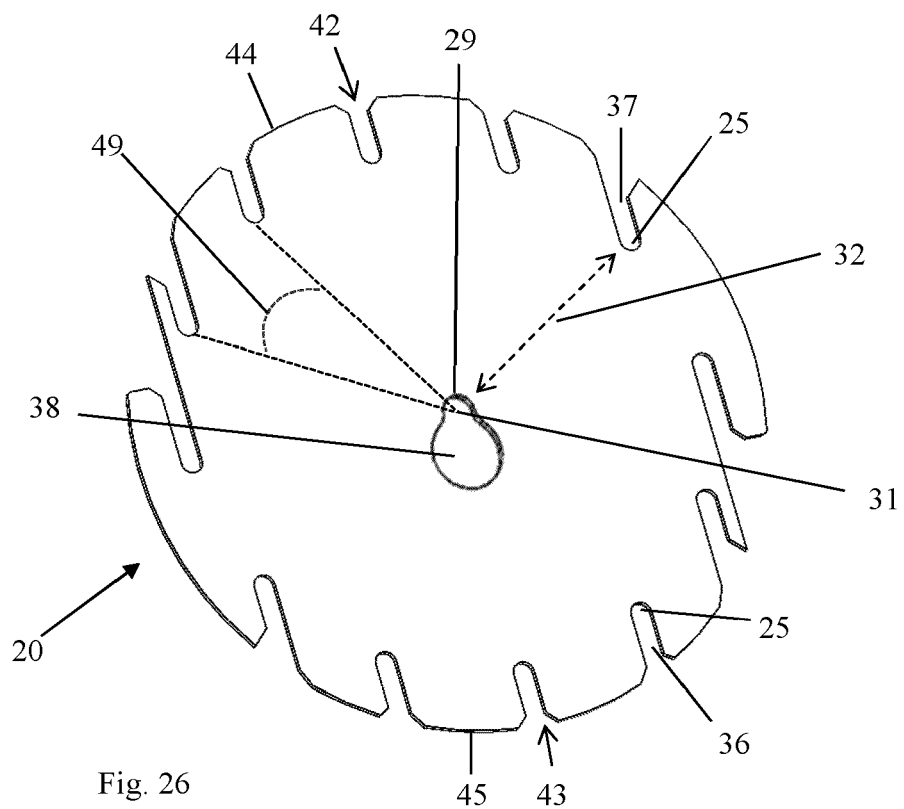
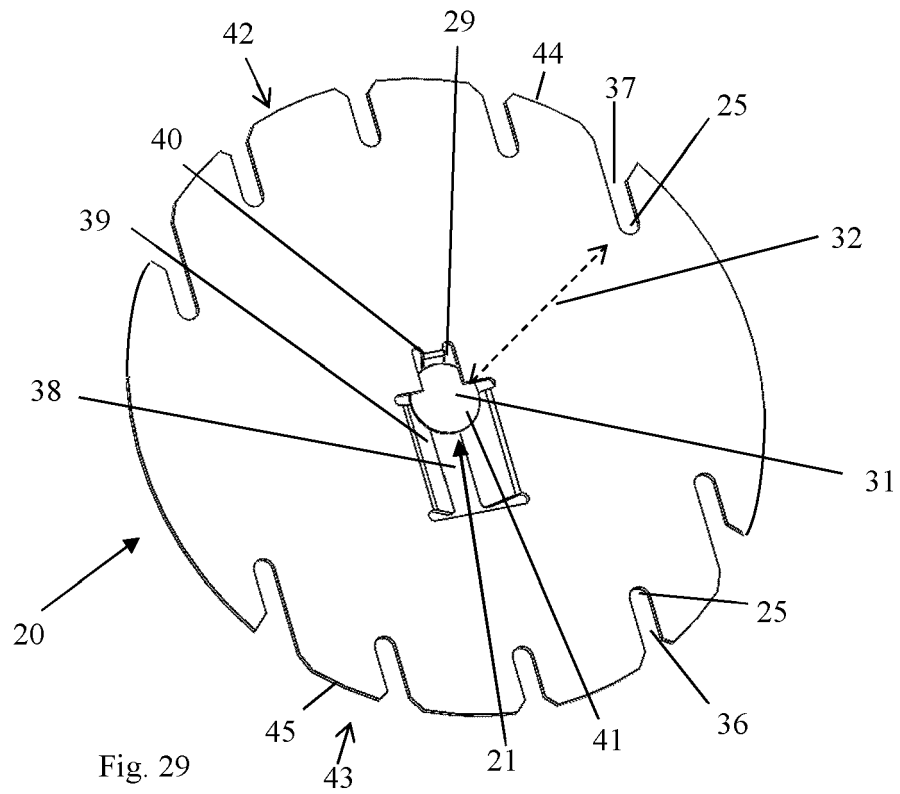
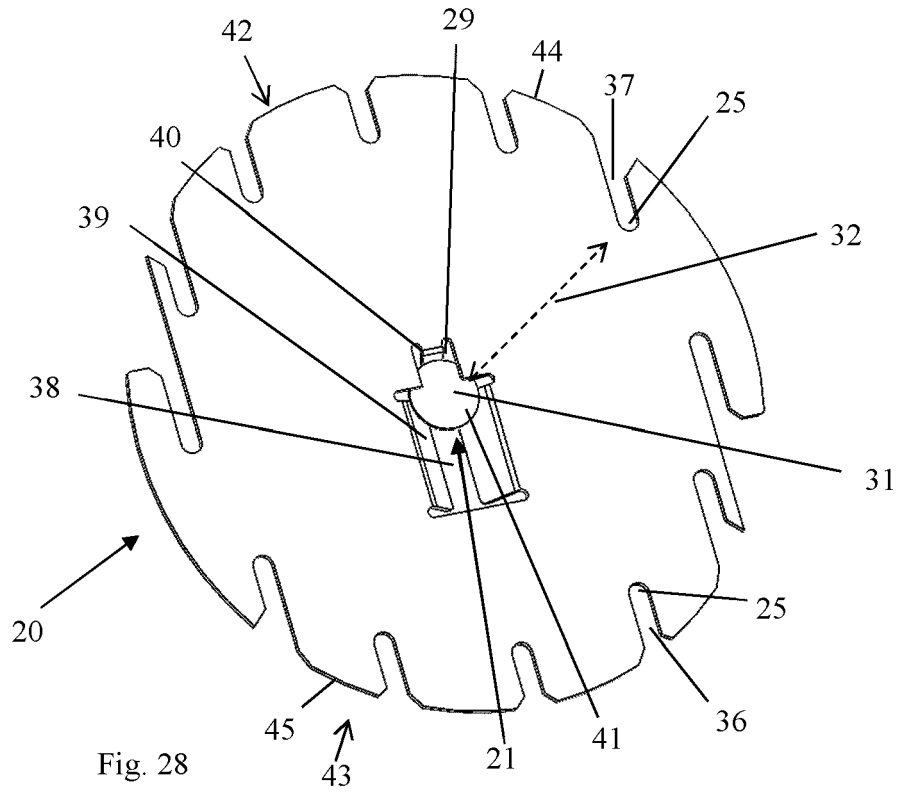


Fig. 21











EUROPEAN SEARCH REPORT

Application Number

EP 24 15 4044

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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A	CN 109 206 099 A (HEBEI ZHUODA BUILDING MAT RES INST CO LTD) 15 January 2019 (2019-01-15) * abstract *	1	
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			E04F
The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
Munich		15 May 2024	Fournier, Thomas
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