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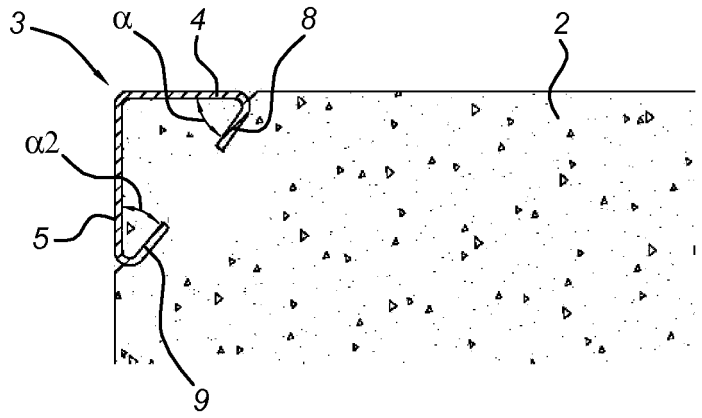
(54) **Floor element**

(57) The present invention relates to a floor element comprising a substantially flat concrete slab and an edge profile attached along the side edges or sides and upper edges of the concrete slab and protecting a peripheral edge thereof, as well as anchoring means for anchoring the edge profile in the concrete slab, the anchoring means being formed by at least two anchoring flanges extending in the longitudinal direction of the edge profile.

Fig 3



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Description

[0001] The present invention relates to a floor element comprising a substantially flat concrete slab and an edge profile attached along the side edges of the concrete slab and protecting a peripheral edge thereof, as well as an anchoring means for anchoring the edge profile in the concrete slab. The invention also relates to a floor composed of such rectangular concrete slabs positioned adjacent to each other.

[0002] Concrete slabs used for the temporary or (semi-) permanent hardening of a foundation are known in the prior art and comprise a number of separate concrete slabs placed adjacent to each other on the substrate. The concrete slabs are simply placed on or removed from the substrate, for example, by providing the slabs with gripping points for a hoisting crane that can hoist the slabs up or let them down, or by using vacuum apparatus.

[0003] Such slabs are known, among others, by the name "Stelcon® slabs" and are described, for example, in the document DE 8.903.721 U. Such slabs have been applied for several decades for the hardening of industrial terrains, by transport companies and transshipment companies, and in building projects and the like. In one known embodiment of such slabs, an angle-steel frame is attached along the side edges or the top and side edges of the slab in order to protect the uppermost edges of the slabs during operation, as well as to protect the floor in use, for example, against the effects of vehicles driving over the slabs. The frame is manufactured from steel with a thickness of typically more than 3 mm. The frame is affixed to the concrete slab by a large number of anchors welded to the edge of the frame and cast into the concrete of the concrete slab.

[0004] One drawback of the known slabs is that the frame is manufactured from a relatively thick material, which is not only expensive but also increases the weight of the floor slab (the frame mass is approximately 20 kg or more). This drawback is further increased by the steel anchors that need to be welded separately to the frame.

[0005] If a thinner material is chosen, for example, to reduce the weight of the frame, this would be at the expense of its rigidity. This means that, in the case of a relatively thin frame, if this is constructed in the known manner, there is a considerable risk of damage to the frame. Moreover, if the number of anchors is reduced in order to reduce weight or costs, this would be at the expense of the degree of anchoring of the anchors in the concrete slab.

[0006] An objective of the present invention is to provide a floor slab and a subfloor comprising such floor slabs which eliminates the above-mentioned drawbacks. It is also an objective of the present invention to produce a floor slab and a subfloor comprising such floor slabs which is provided with a frame that is relatively light, has a relatively high tensile strength and can be well anchored in the concrete slab.

[0007] To achieve this, according to a first aspect of the invention, a floor element is provided, comprising a substantially flat concrete slab and an edge profile attached along the side edges or the sides and upper edges of the concrete slab, thus providing protection of a peripheral edge thereof, as well as anchoring means for anchoring the edge profile in the concrete slab, in which the anchoring means are formed by at least two anchoring flanges extending in the longitudinal direction of the edge profile, wherein the edge profile comprises two profile parts formed substantially at a right angle relative to each other, the longitudinal ends of which profile parts are bent towards each other in order to provide anchoring flanges, and in that at least one of the anchoring flanges comprises a part adjacent to the part that is bent inwardly, the first part of which being bent outwards or inwards relative to the inwardly bent part. In this embodiment one of the anchoring flanges can be provided with such an adjacent part, but in other embodiments each of the anchoring flanges is composed of such an adjacent part.

[0008] The anchoring flanges have a dual effect. On the one hand they increase the constructive strength of the edge profile so that an edge profile with a small material thickness would suffice (typically between 0.8 mm and 2 mm, in some cases between 2 mm and 3 mm, instead of the customary greater thickness), and on the other hand they ensure a good anchoring of the edge profile in the concrete slab in that the known point anchoring method is replaced by linear anchoring. In one particularly advantageous embodiment, the anchoring flanges are composed of sheet steel, preferably with the aforementioned thickness of between 0.8 and 2 mm. Sheet steel can be readily bent, thus enabling the profiles to be formed in a relatively simple manner with the first bent part and the corresponding second bent part.

[0009] The edge profile preferably extends only to the upper edge of the concrete slab. Therefore, in this embodiment the edge profile does not extend up to or beyond the lower edge of the concrete slab. Nevertheless, the anchoring flanges ensure sufficient anchoring of the edge profile on the concrete slab.

[0010] The anchoring flanges are formed by inwardly bent longitudinal edges of the edge profile. It appears that the inwardly bent longitudinal edges cause improved anchoring of the profiles on the concrete slab. Such anchoring flanges are relatively easy to realize. An even better anchoring method can be achieved when at least one of the anchoring flanges is provided with a further adjacent part, for example, by outwardly or inwardly bending the adjacent part relative to the anchoring flange so that the portion has a different position relative to the rest of the profile.

[0011] In order to ensure good accessibility from the inside of the profile when the concrete is poured, and, as a result thereof, a good anchoring of the edge profile, at least one of the anchoring flanges comprises a first, inwardly bent part and a second part adjacent to the first part, the second part being bent outwards relative to the

first part. The second part thus ensures improved anchoring without reducing accessibility.

[0012] According to one embodiment of the invention the edge profile comprises two profile parts formed essentially at a right angle relative to each other, the longitudinal ends of which are bent towards one another in order to provide anchoring flanges. The angle (α) between a profile part and the corresponding bent anchoring flange lies between approximately 30 and 135 degrees, preferably between 45 and 90 degrees.

[0013] In one embodiment of the invention the edge profile consists essentially of one piece and is provided with hinge means. The hinge means are formed, for example, by a number of slits in the profile part. By partially cutting into the profile, for example, everything except a side wall of the profile, the profile can be readily formed into the desired shape by bending the side wall. In the case of a rectangular concrete slab, the edge profile is divided into four parts. The edge profile can then be provided, for example, at three different positions with such hinge means in order for the four parts of the edge profile to form a single rectangular part. After the ends of the edge profile have been fastened to each other and the edge profile is introduced into a mold, the concrete can be poured into the mold. After the concrete has hardened, a concrete slab is obtained which is provided along its uppermost peripheral edge with the desired edge profile. In this particular embodiment one single edge profile would suffice for each concrete slab which, in addition, requires only a single fastening step.

[0014] The fastening means for the fastening of the ends of the edge profile to each other can be embodied, for example, to provide a 'click'-engagement. In another embodiment pop rivets are used to fasten the ends of the edge profile or at least parts of the edge profile to each other.

[0015] According to another aspect of the invention, a floor element is provided comprising an essentially flat, rectangular concrete slab and an edge profile affixed along the four edges or sides and upper edges of the concrete slab, thus protecting a peripheral edge thereof, as well as anchoring means for anchoring the edge profile in the concrete slab, the edge profile of which comprises:

- a number of elongated edge profile elements;
- coupling elements for the mutual coupling of the edge profile elements at the location of the corners of the concrete slab,
- fastening means for fastening the edge profile elements to the coupling elements.

[0016] By using separate coupling elements the edge profile elements can be coupled with each other without a welding connection being required.

[0017] The fastening means for the coupling of the coupling elements to the respective edge profile elements are preferably embodied in such a manner that they are formed on the edge profile elements and coupling elements, so that separate customary fastening parts such as bolts and nuts, for example, are no longer necessary.

[0018] In one embodiment the fastening means comprise a resilient lip affixed to a coupling element which is embodied to rest within a recess in the edge profile element which corresponds to the lip. In this manner a "click" engagement can be established between the coupling element and the edge profile elements by sliding the coupling elements into the proper edge profile elements until the lip falls into place in the corresponding opening. On the other hand, the resilient lip can also be provided on the edge profile element and the openings in the coupling element.

[0019] In a particularly advantageous embodiment, the edge profile element consists of one piece that is cut in such a manner at a number of positions (for example, at three positions in the case of a rectangular floor slab and at two positions in the case of a triangular floor slab) that it can be pivoted to certain positions relative to each other in order to bring the edge profile into the desired (that is, rectangular or triangular) configuration.

[0020] According to one embodiment of the present invention openings are provided in at least one of the anchoring flanges in which concrete can be poured during the manufacture of the floor slabs, thus enabling the further anchoring of the flanges to the concrete slab.

[0021] Further advantages, features and details of the present invention are described according to one embodiment thereof. In the description below, reference is made to the accompanying drawings, in which:

Fig. 1 is a perspective view of a floor slab provided with an edge profile according to a first embodiment of the invention;
Fig. 2 is a top view of a floor slab according to the first embodiment;
Fig. 3 shows a section of a floor slab according to the first embodiment;
Fig. 4 shows a section of a floor slab according to a second embodiment;
Fig. 5 shows a section of a floor slab according to a third embodiment;
Fig. 6 is a perspective view of a part of the edge profile element of figure 5;
Fig. 7 is a top view of a part of the edge profile element of figure 5;
Fig. 8 shows a section of a floor slab according to a fourth embodiment;
Fig. 9 is a perspective view of an embodiment of a coupling element according to the present invention;
Fig. 10 is a top view of a coupling element of figure 9;
Fig. 11 is a perspective view of a part of two edge profile elements fastened to one another by means of a coupling element, and
Figures 12A-12C respectively show top views of an edge profile in the original state, an edge profile hinged in a rectangular engagement in an intermediate state, and an edge profile in a final state.

[0022] Figures 1 and 2 show a floor slab 1 according to one embodiment of the invention. The slab is composed of a reinforced or non-reinforced concrete slab 2 on the uppermost peripheral edges to which an edge profile 3 is attached. In the embodiment shown, floor slab 1 has a rectangular shape (with typical dimensions of length 200 cm, width 200 cm and height 12 cm, 14 cm, 16 cm, 18 cm or 20 cm, or, of course, any other conceivable dimensions), although other polygonal shapes are also conceivable. In the embodiment illustrated, the concrete slab 2 is not provided with a means of reinforcement, but in other embodiments that are not shown the concrete is reinforced, for example, by placing one or more reinforcement mats therein. The concrete slab may consist of gravel-based concrete having a wear-resistant upper layer, but the use of concrete with a different composition is also possible. The edge profiles 3 are manufactured from metal, for example, from rolled sheet steel, or plastic.

[0023] Such floor slabs with an angle-steel frame are particularly well-suited for the temporary or permanent hardening of a foundation. In order to facilitate the laying and removal of the floor, in some embodiments the floor slabs are provided, in a known manner, with hoisting bars to enable the slabs to be lifted and transported. There are also other embodiments without hoisting bars, whereby laying work is performed, for example, with the use of vacuum apparatus.

[0024] In practice, a floor is composed of a number of floor slabs placed side by side with spacing in between the slabs in the region of between 0.5 cm to 2 cm. As a result of this relatively small spacing and the fact that the top of the edge profiles 3 is arranged substantially level with the upper edge of the concrete slab 2, vehicles are able to drive comfortably over the floor.

[0025] Figure 3 shows a first embodiment of an edge profile 3 according to the present invention. The edge profile 3 is composed of a horizontally positioned profile part 4 and a vertically positioned profile part 5 arranged at a right angle thereof. There are no (or fewer) anchors fastened to profile parts 4 and 5 as would otherwise be customary in such cases, so that the means of anchoring must be achieved in a different manner. In the embodiment shown, anchoring is achieved by bending the longitudinal edges of profile parts 4 and 5 somewhat in order to form respective anchoring flanges 8 and 9. By applying an appropriate degree of bend to the longitudinal edges and by choosing anchoring flanges of a satisfactory width, sufficient concrete remains in place behind the flanges to ensure a strong anchoring of the profile of concrete slab 2.

[0026] In the embodiment illustrated, the longitudinal edges are bent along the entire length of the profile and in other embodiments the profile parts are bent only along a part of the length. The angle α_1 between the horizontal profile 4 and the protruding flange 8 and the angle α_2 between the vertical profile 5 and the upright flange 9 is the same as in the embodiment shown and lies within the range of between 30 to 135 degrees, preferably between 45 and 90 degrees. In this way, a good anchoring of the profile is achieved.

[0027] The selected distance d_1 between the ends of anchoring flanges 8 and 9 must be wide enough to allow a sufficient amount of concrete to flow into the spacing between the profile parts during the manufacture of the floor. Depending, among other things, on the composition of the concrete used, the distance d_1 may appear to be too small. In order to achieve a greater distance and hence cause a simpler filling of the profile, in the second embodiment of the invention shown in figure 4, the angle α ($=\alpha_1=\alpha_2$) chosen is approximately or very close to 90 degrees.

[0028] In situations that require improved filling, in combination with a more improved anchoring means, a third embodiment of the invention may be applied, as is illustrated in figures 5-7. The third embodiment is, to a large extent, quite similar to the second embodiment but differs in that further flange parts 12 and 13 are attached to flanges 10 and 11. The angle β (figure 5) must be greater than 90 degrees, preferably between 120 and 150 degrees in order not to hinder the supply of concrete during the manufacturing process. In this embodiment, the spacing d_3 can be the same as the spacing d_2 shown in figure 4, so as to enable a good filling. Moreover, because flanges 10 and 11 are widened, an improved anchoring of the profile can also be achieved.

[0029] Figures 6 and 7 show that respective openings 17 and 16 are positioned in anchoring flanges 10, 11, i.e. in the parts directly engaging profile parts 4 and 5 thereof and/or in the opposite parts 12 and 13 thereof. During the manufacturing process, concrete may remain in openings 16, 17 which will result, after hardening, in a further anchoring of profile 3 to concrete floor slab 2. If necessary, such openings may also be provided in each of the remaining embodiments of the invention described here. If the anchoring provided by the anchoring flanges themselves is sufficient, openings 16, 17 may be omitted.

[0030] Figure 8 shows a fourth embodiment of the invention. The fourth embodiment is a combination of the second embodiment illustrated in figure 4 and the third embodiment of the invention illustrated in Figures 5-7. Flange 10, that borders upon the horizontal profile part 4, is not widened here, whereas flange 14, which borders upon upright part 5 of the profile, is widened. In the embodiment shown, the widened part is bent somewhat in an outward direction. In other embodiments (not-shown) the widened part is bent inwards, as opposed to the embodiment shown. These embodiments of the edge profile require less material than in the third embodiment, whilst providing a better anchoring than in the case of the second embodiment.

[0031] Figures 1 and 2 show that edge profile 3 is attached along the four side edges of concrete slab 2. The edge profile here is composed of four edge profile elements 3'-3'''' fastened to each other at each end. In some situations the edge profile elements are welded together.

When prefabricated elements are used that have been previously treated against rust formation, this often means that the pretreatment is damaged at the site of the welds and that an intensive additional anti-corrosion treatment is therefore required. This drawback is all the greater if, on the other hand, untreated prefabricated elements are used. After the untreated prefabricated elements are welded to each other an intensive surface treatment of the elements must be undertaken in order to protect them adequately from rust and other external influences.

[0032] In order to avoid welding the edge profile elements in the corners, in certain embodiments fastening means can be used whereby the edge profile elements are fastened to each other. The edge profile elements can be "clinched", for example. The edge profiles can be fastened to each other, for example, by means of rivets, in particular by (but not limited to) the use of pop rivets. The fastening means are then formed by the pop rivets, also called blind rivets. Such blind rivets are known according to prior art and a further description of them is therefore omitted here.

[0033] According to a further aspect of the invention, fastening means in combination with coupling elements may be used in order to avoid welding the edge profile elements in the corners. Edge profile elements can be fastened to each other in the corners with the use of coupling elements. Figures 9 and 10 illustrate an embodiment of such a coupling element 20. Coupling element 20 is composed of a first U-profile 21 and a second U-profile 22 positioned at a right angle thereto. The uppermost part of the two U-profiles 20, 21 is provided with two protruding strips 29, each having a resilient lip 30 fastened thereto. Likewise, the lowest part of both U-profiles 20, 21 is provided with two lips 31. Lips 30 and 31 are embodied in such a manner that they slide automatically under resilient force into the respective openings 19 and 18 thus producing a 'click'-engagement between coupling element 20 and the respective edge profile. The edge coupling elements and the coupling piece are shown in more detail in the mounted assembly illustrated in figure 11. As a result thereof, the edge profile elements can be coupled to each other at the four corner points in a rapid and efficient manner without any subsequent operation being required, such as the welding of the elements.

[0034] Figure 12A shows a top view of an elongated edge profile 32 composed of a single part. The edge profile 32 has four edge profile elements 33-34, each of which may be affixed along a single edge of the concrete slab. Edge profile elements 33-34 can be hinged relative to each other by three hinge parts 38. These hinge parts are formed by providing the edge profile with three slits 37. The slits are formed in such a manner that the edge profile is provided with three V-shaped recesses. The shape, position and dimensions of the recesses are chosen in such a manner that the edge profile can be hinged along hinges 38 (compare the intermediate state shown in figure 12B, just before the final state is reached, as shown in figure 12C) until the edge profile can be caused to produce a rectangular configuration. Figure 12B shows that ends 39 and 40 of edge profile elements 33 and 36 of edge profile 32 can be caused to engage each other after a coupling piece 41 is applied. Here, the coupling piece ensures the required mutual fastening of both ends 39 and 40 of edge profile 32.

[0035] The present invention is not limited to the preferred embodiments described herein. The requested rights are determined by the following claims, within the scope of which numerous modifications are conceivable.

Claims

1. A floor element, comprising a substantially flat concrete slab (2) and an edge profile (3) attached along the side edges or the sides and upper edges of the concrete slab, thus providing protection of a peripheral edge thereof, as well as anchoring means for anchoring the edge profile in the concrete slab, in which the anchoring means are formed by at least two anchoring flanges extending in the longitudinal direction of the edge profile, **characterized in that the** edge profile comprises two profile parts (4, 5) formed substantially at a right angle relative to each other, the longitudinal ends of which profile parts are bent towards each other in order to provide anchoring flanges, and **in that** at least one of the anchoring flanges comprises a part (12, 13; 15) adjacent to the part (8, 9; 10, 11, 14) that is bent inwardly, the first part of which being bent outwards or inwards relative to the inwardly bent part (8, 9; 10, 11, 14).

2. The floor element according to Claim 1, **characterized in that** the anchoring flanges are manufactured from sheet steel and that the anchoring flanges are formed by bending the sheet steel.

3. The floor element according to Claim 2, wherein the edge profile is manufactured from sheet steel with a thickness of between approximately 0.8 mm and 2 mm.

4. The floor element according to any preceding claim, wherein the edge profile extends only along the upper edge of the concrete slab.

5. The floor element according to any preceding claim, wherein the edge profile consists essentially of a single part and is provided with hinge means for applying the edge profile around practically the entire upper edge of the concrete slab.

6. The floor element according to Claim 5, wherein the hinge elements are formed by a number of slits in the profile part.

7. The floor element according to any preceding claim, wherein the angle (α) between a profile part and the corresponding bent anchoring flange is between approximately 30 and 135 degrees, preferably between 45 and 90 degrees.

8. The floor element according to any preceding claim, wherein the angle (α) is between approximately 70 and 110 degrees and angle (β) is between approximately 120-150 degrees.

9. The floor element according to any preceding claim, wherein the edge profile is manufactured from metal and/or plastic.

10. The floor element according to any preceding claim, wherein the distance (d) between the edges of the anchoring flanges is at least 2 cm, preferably at least 3 cm.

11. The floor element according to any preceding claim, comprising fastening means for fastening the ends of the edge profile to each other.

12. The floor element according to Claim 11, wherein the fastening means are embodied to cause a click-engagement.

13. The floor element according to Claim 11, wherein the fastening means comprise one or more rivets, in particular blind rivets.

14. The floor element according to any preceding claim, wherein openings are provided in at least one of the anchoring flanges into which concrete can be poured for the further anchoring of the flanges in the concrete slab.

15. A floor element, preferably a floor element according to any of the preceding claims, comprising:

- a substantially flat, rectangular concrete slab;
- an edge profile attached along the four edges or the sides and upper edges of the concrete slab, thus providing protection of a peripheral edge thereof, provided with anchoring means for anchoring the edge profile in the concrete slab, wherein the edge profile comprises one or more elongated edge profile elements around the upper edge of the floor element anchored in the concrete slab,
- coupling elements for the mutual engagement of the ends of one or more edge profile elements on one or more of the corners of the concrete slab,
- fastening means for fastening the edge profile elements to the coupling elements,

characterized in that the fastening means are formed on the edge profile elements and the coupling elements.

Fig 1

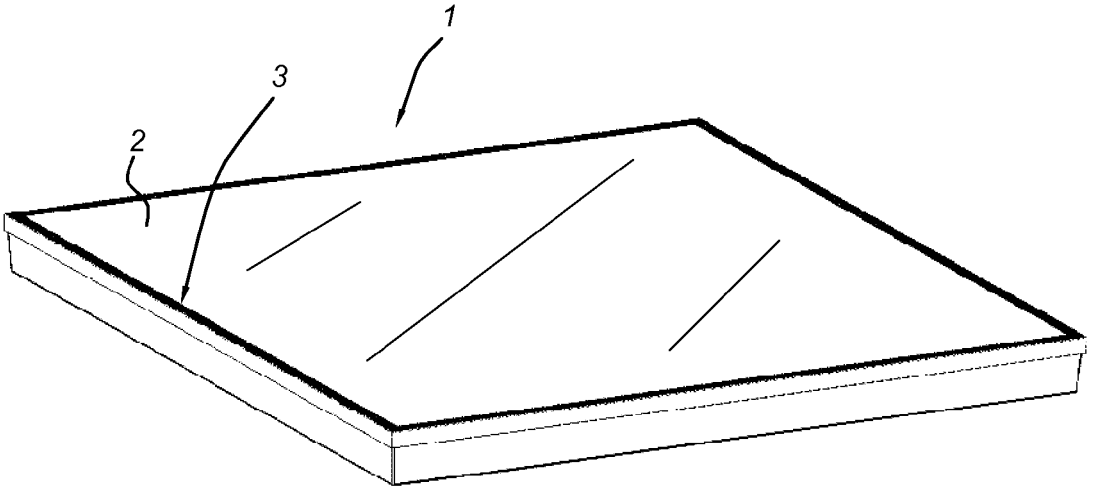


Fig 2

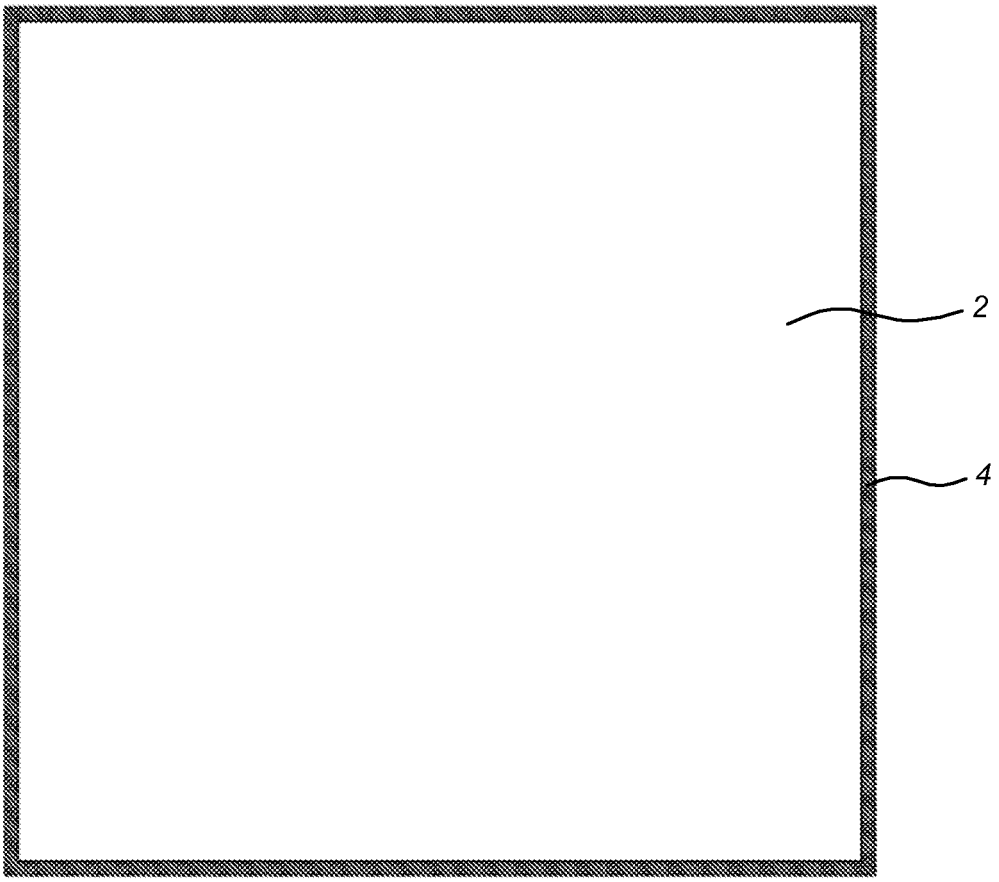


Fig 3

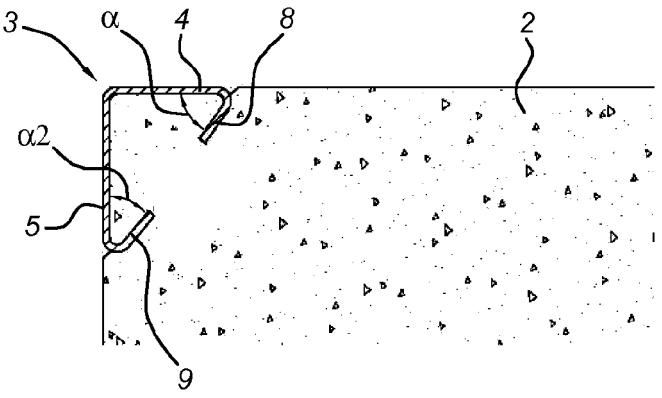


Fig 4

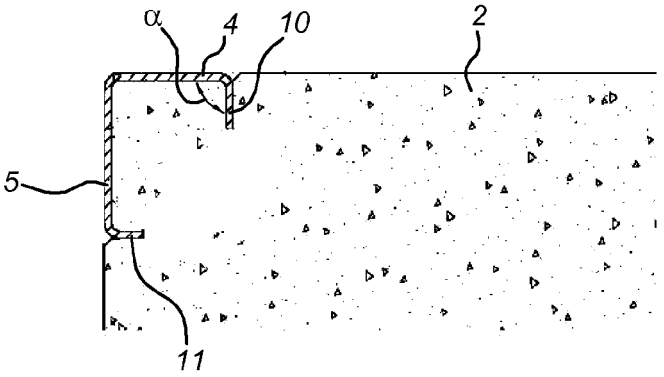


Fig 5

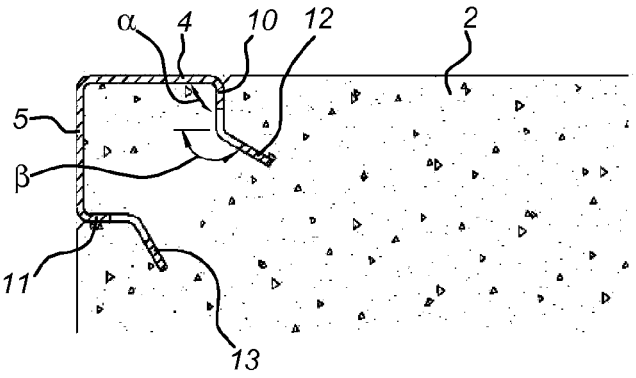


Fig 6

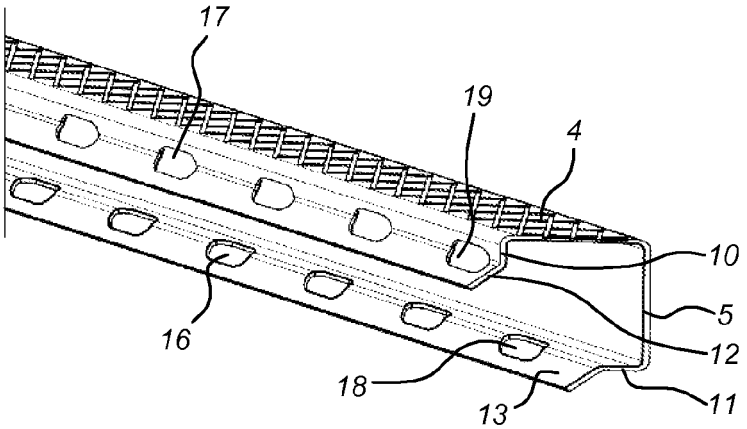


Fig 7

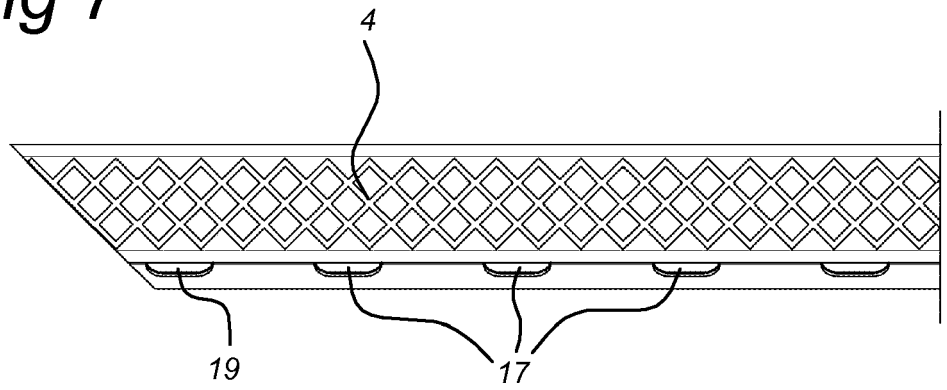


Fig 8

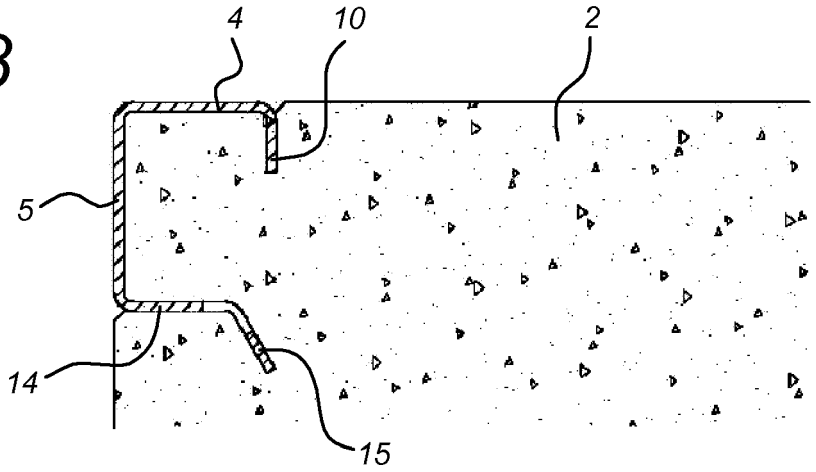


Fig 9

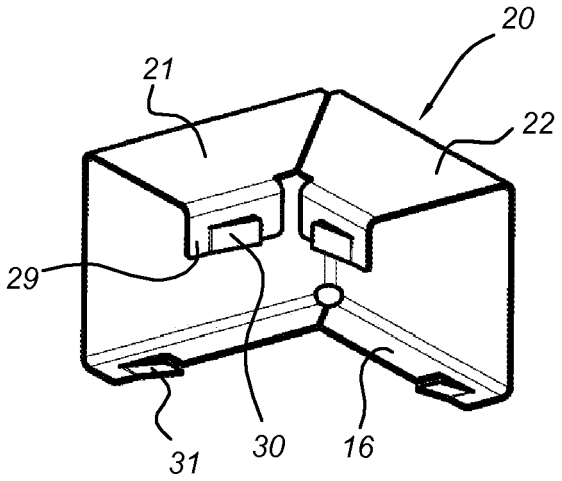


Fig 10

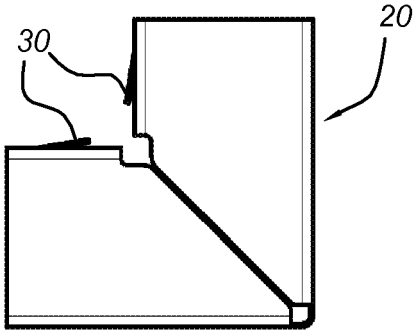


Fig 11

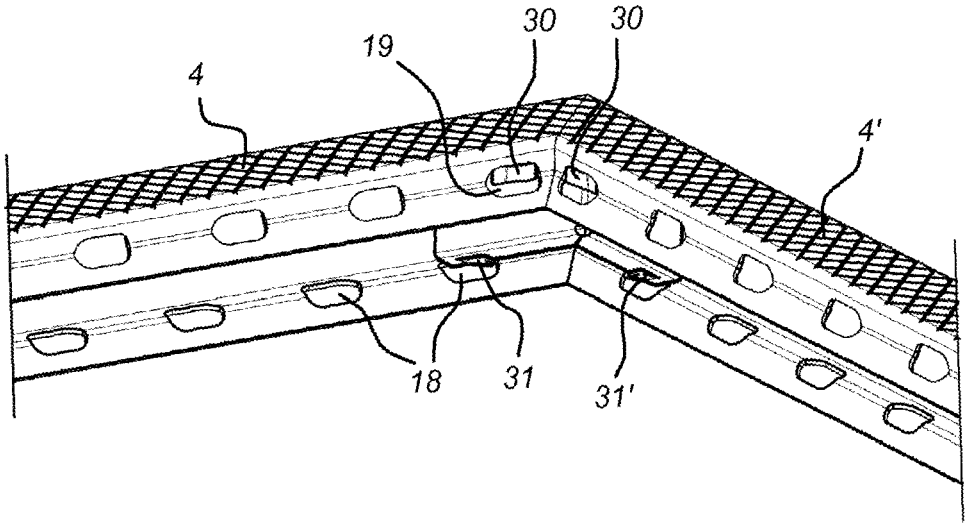


Fig 12a

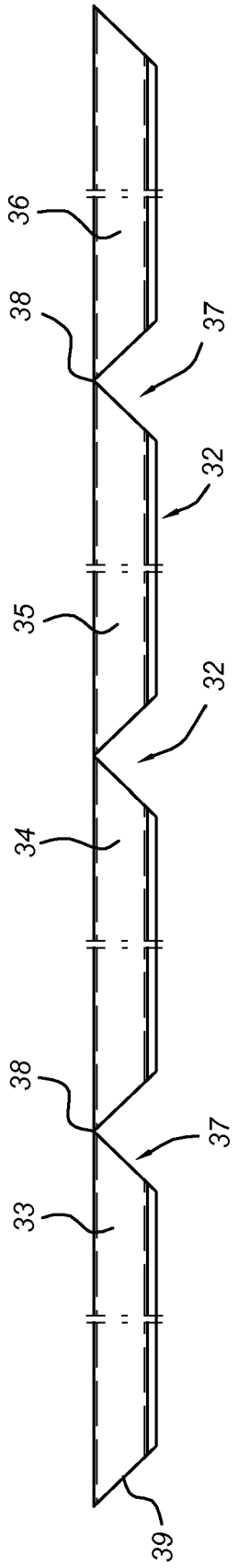


Fig 12b

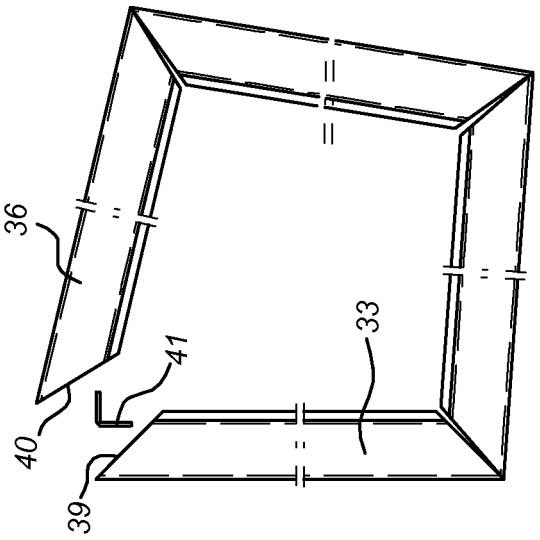
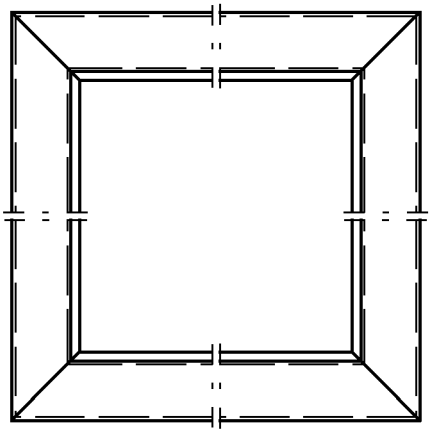


Fig 12c



REFERENCES CITED IN THE DESCRIPTION

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