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(71) Applicant: **GILBERT STEEL SOLUTIONS, naamloze vennootschap**
2400 Mol (BE)

(72) Inventor: **CUYPERS, Gilbert**
3920 Lommel (BE)

(74) Representative: **Van hunsel, Lieven M.S. Archimedes Patents**
Arenbergstraat 13
2000 Antwerpen (BE)

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(54) **ASSEMBLY KIT AND METHOD FOR ASSEMBLING A SAFETY RAILING, AS WELL AS SUCH A SAFETY RAILING**

(57) Assembly kit (1) for mounting a safety railing (2) on one or several edges (3) of a provisional floor slab (4) with the following elements;
- slab elements (6, 7) for forming an edge formwork (5) on the respective edges (3) or at a certain distance (D) therefrom;

- posts (19) serving as upright support posts of the safety railing (2); and,
- for each post (19), a pair of retaining elements (20) with which each post (19) can be retained on the outside (23) of the edge formwork (5) and which can cooperate with the slab elements (6, 7) by resting on the latter.

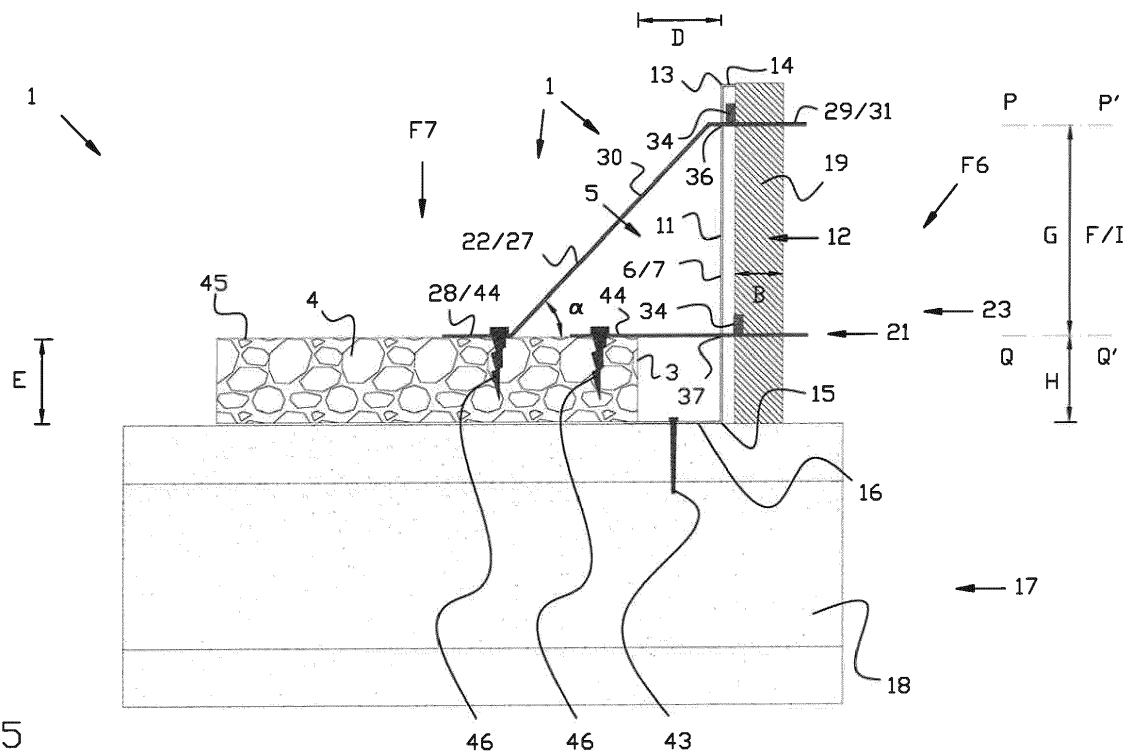


FIG 05

Description

[0001] The present invention first and foremost concerns an assembly kit for assembling a safety railing.

[0002] More specifically, the invention relates to such an assembly kit with which a safety railing can be assembled on a construction site along one or several edges of a provisional floor or roof slab, which is composed, for example, of wide floor slabs, or so-called precast concrete slabs or concrete vaults.

[0003] In certain embodiments, such an assembly kit according to the invention is typically suitable for mounting a safety railing along one or more edges of such a provisional floor or roof slab, by attaching parts of the assembly kit to an adjacent fixed structure, for example formed by supporting walls or beams or the like.

[0004] In specific applications where no such adjacent fixed structure is present along one or several edges of such a provisional floor or roof slab, for example in large window openings where the floor slab is not supported by a fixed structure, an adapted assembly kit according to the invention is ideally suited for mounting a safety railing along one or more edges of such a provisional floor or roof slab that is not directly supported, by attaching parts of the assembly kit only to the provisional floor or roof slab itself and not to an adjacent fixed structure.

[0005] Wide floor slabs or precast concrete slabs are relatively thin concrete slabs of about 5 to 6 cm to 10 cm thick, which are already provided with a certain reinforcement and which are intended to compose a provisional floor slab or roof slab by applying them side by side on an underlying structure formed, for example, of wooden beams, which are typically used to support a formwork, or by walls or support beams or the like.

[0006] A provisional floor or roof slab which is composed of concrete vaults has a greater thickness that can vary from 13 to 35 cm, for example.

[0007] Afterwards, the intention is to pour another layer of concrete on top of the formed provisional floor or roof slab to form a full concrete floor or a full concrete roof.

[0008] In this case, the wide floor slabs serve as permanent formwork.

[0009] It is clear that such wide floor slabs are, for example, very suitable for successively realising the floors of several buildings storeys.

[0010] In order to prevent operators from falling from this temporarily laid or as yet unfinished floor or roof slab during the works due to inattention, tripping or for any other reason, a usually temporarily mounted safety railing must be provided on the edges thereof as a form of roof edge protection.

[0011] Installing a temporary yet high-performance safety railing in the aforementioned circumstances is not easy in itself.

[0012] An additional problem, moreover, that is associated with realising floors or roofs by using wide floor slabs or precast concrete slabs is that an edge formwork must be provided on the edges before pouring the con-

crete onto the provisional floor or roof slab.

[0013] Many ways are known for installing edge formworks, but the installation thereof is usually very labour-intensive in itself.

[0014] It is also clear that it is best to install a safety railing in such a way that it does not hinder any further works, and in particular the pouring of an additional concrete layer.

[0015] In addition, for safety reasons, an aforementioned safety railing is preferably provided on the one hand in a place that closely adjoins the provisional floor or roof slab.

[0016] On the other hand, in order to avoid further works from being hindered, it is best to provide such a safety railing in an area outside the perimeter formed by the edge formwork.

[0017] In addition, both the edge formwork and the safety railing must be provided on the edges of the provisional floor or roof slab, and the installation of the edge formwork itself should preferably not be hindered by the presence of a safety railing and vice versa.

[0018] From what precedes it follows that the efficient installation of both a safety railing and an edge formwork on such a provisional floor or roof slab is far from self-evident.

[0019] This is particularly the case when the floor slab is not supported on the outer edge by, for example, a wall or concrete beam.

[0020] According to the current state of the art, there are no means or methods available that can solve these problems in an efficient, well thought-out and universally applicable manner.

[0021] The present invention therefore aims to offer a solution to one or more of the aforementioned and/or other disadvantages.

[0022] More specifically, the invention aims to offer an assembly kit and a method for mounting a safety railing around a provisional floor or roof slab composed of wide floor slabs, making very effective use of the available space in order to not only avoid obstructing further works, but also to prevent that the installation of an edge formwork would hinder the installation of a safety railing on the edges of the provisional floor or roof slab and vice versa.

[0023] Another object of the invention is to offer an assembly kit which creates a synergy between the different elements of the assembly kit, so that its elements can work together and can each contribute to fulfilling different functions, such as increasing safety and efficiently installing an edge formwork.

[0024] Yet another object of the invention is to use as little material as possible and to try to obtain a support and clamping of a safety railing that is very reliable but requires as little assembly work and assembly equipment as possible.

[0025] An important aim here is to provide an assembly kit which is such that, after the works have been completed, no or hardly any dismantling work needs to be

carried out at height, so that there is far less risk of loose parts such as wooden formwork panels, bolts, nuts and the like falling down than is currently the case with the known techniques.

[0026] To this end, the invention concerns an assembly kit for mounting a safety railing on a construction site, more specifically on one or several edges of a provisional floor or roof slab which is composed, for example, of wide floor slabs, or so-called precast concrete slabs, or of concrete vaults, in which the assembly set includes at least the following elements;

- one or several slab elements to form an edge formwork on the relevant edges of the provisional floor or roof slab or at a certain distance therefrom;
- posts acting as upright support posts for the safety railing; and,
- for each post, a pair of retaining elements with which each post can be retained on the outside of an edge formwork formed with the slab elements and which can interact with the slab elements by resting on them to form a support for the post in question.

[0027] A major advantage of an assembly kit according to the invention for realising a safety railing is that the assembly kit contains slab elements which can be used to create an edge formwork on the provisional floor or roof slab, and wherein at the same time these slab elements also form a support for mounting a safety railing.

[0028] In short, an enormous synergy is obtained in which the slab elements needed to realise an edge formwork also contribute, and even to a large extent, to the support of the safety railing.

[0029] In addition, the retaining elements are such that they can be used to hold posts of a safety railing on the outside of an edge formwork formed with the slab elements, while the slab elements are further intended to only serve as a support for the safety railing and are not used, for example, to absorb momentary forces and the like.

[0030] By only taking the slab elements as a support and therefore, in principle, only exerting a vertical force on the slab elements, the deformation of the slab elements is minimal or non-existent.

[0031] Furthermore, the edge formwork is hardly or not affected by the safety railing and can continue to fulfil its function as a formwork without any problems.

[0032] Another major advantage of an assembly kit according to the invention is that very few elements are used, namely, on the one hand, the minimum number of slab elements required for the edge formwork and, on the other hand, a pair of retaining elements which can each time work together with these slab elements for retaining and supporting posts of the safety railing to be mounted, in addition to a number of other fasteners, such as screws and bolts to fix these elements.

[0033] In a preferred embodiment of an assembly kit according to the invention, the retaining elements and

the slab elements can work together by extending the retaining elements through slots provided in the slab elements and making them rest on an edge of a corresponding slot to form a support for a corresponding post, without the retaining elements having to be fixed to the corresponding slab element of the edge formwork.

[0034] A major advantage of such an assembly kit according to the invention is that, for the retaining elements and the slab elements to work together, only a number of slots need to be provided in the latter, which is very easy to achieve and implies only a minimal adaptation to an uninterrupted slab section.

[0035] It is also important to note that there is no need for a fixed connection between the slab elements and the retaining elements, which makes the installation very easy and ensures that the load on the slab elements is essentially only vertical.

[0036] Hence, another important advantage of this embodiment of an assembly kit according to the invention is that efficient use is made of the strength of the slab elements, which are essentially only vertically loaded by the safety railing, with these slab elements obviously being able to bear a load most easily in this vertical direction without being significantly deformed.

[0037] Once again, this means that there is only impact on the slab elements where they can best absorb the applied load.

[0038] In yet another preferred embodiment of an assembly kit according to the invention, the retaining elements are provided at a first end with a flat slab-shaped part with a rectangular cross-section and each slab element is provided with one or several pairs of parallel slots that can work together with a pair of retaining elements, wherein these slots are complementary to the above-mentioned first end of the retaining elements and have dimensions to that end corresponding to the dimensions of the rectangular cross-section of that first end, so that the first end of the retaining elements can be inserted through a corresponding slot in the slab element.

[0039] A major advantage of this embodiment of an assembly kit according to the invention is that both the retaining means and the slots in the slab elements have a very simple shape.

[0040] More specifically, the slots are rectangular or linear, which is very easy to achieve.

[0041] In another preferred embodiment of an assembly kit according to the invention, each pair of retaining elements consists of a first support plate and a second support plate, which are flat, with the second support plate having two folding lines which extend across the length of the plate concerned and which, for example, consist of a series of elongated perforations, wherein the folding lines allow the second support plate to be folded into a plate-shaped element with two flat ends parallel to each other and connected by means of a flat intermediate section which extends diagonally at an angle in relation to the ends of the second support plate.

[0042] The aim is here that the first support plate is

inserted with its first flat end through a lower slot in the slab element, while the first flat end of the second support plate is inserted through a higher slot.

[0043] The other ends of the support plates must be fixed to the provisional floor or roof slab or to an adjacent fixed structure such as a wall or wooden girder or the like.

[0044] A major advantage of this embodiment of an assembly kit according to the invention is that the retaining elements are very simple, with the second support plate being moreover easily adaptable to the circumstances.

[0045] Other aspects will be further illustrated by means of the figures.

[0046] The invention also relates to a method for assembling a safety railing on a construction site, more specifically on one or more edges of a provisional floor or roof slab, which is composed, for example, of wide floor slabs, or so-called precast concrete slabs, or of concrete vaults.

[0047] A method according to the invention comprises at least the following steps:

- fixing one or several slab elements to the respective edges of the provisional floor or roof slab or at a certain distance therefrom to form an edge formwork;
- providing pairs of slots in the slab elements;
- applying pairs of retaining elements, whose first end is inserted into a slab element through an aforementioned slot and whose second end is fixed to the top or underside of the floor or roof slab or to an adjacent fixed structure;
- arranging a post in each pair of mounted retaining elements wherein each post serves as an upright support post for the safety railing, such post being passed through openings provided in the first end of the relevant pair of retaining elements in order to retain the post; and,
- making each post rest on the corresponding pair of retaining elements by means of a pair of protrusions provided on or attached to the post, the retaining elements thus cooperating with the corresponding slab element of the edge formwork to form a support for the corresponding post on the outside of an edge formwork formed with the slab elements.

[0048] A major advantage of the method according to the invention is that it allows both a safety railing and an edge formwork to be attached very quickly to a provisional floor or roof slab that does not rest on a fixed structure.

[0049] This is particularly the case where it is not possible to attach an edge formwork and a safety railing to adjacent fixed structures other than the provisional floor or roof slab itself, for example where there are large window openings or overhanging structures or the like. The pair of retaining elements, which is reinforced, is attached in this case to the vault or precast concrete slab itself. Each of the operations to be carried out are very simple and do not require any complicated fasteners, for exam-

ple.

[0050] The invention also relates to a safety railing for a building site that is provided on one or more edges of a provisional floor or roof slab.

[0051] It is characteristic of such a safety railing according to the invention that posts which serve as upright support posts for the safety railing are each held and supported by a pair of retaining elements on the outside of an edge formwork formed at the relevant edges of the provisional floor or roof slab or at a certain distance therefrom by means of slab elements, wherein the retaining elements and the slab elements work together as the retaining elements extend through slots in the slab elements and rest there on an edge of a corresponding slot to form a support for the corresponding post, without the retaining elements being fixed to the corresponding slab element of the edge formwork.

[0052] Once again, a major advantage of such a safety railing according to the invention is that it is very simple to mount, with posts of the safety railing resting on slab elements of an edge formwork, as a result of which the necessary stability of the safety railing is guaranteed on the one hand, and concrete can be efficiently and safely poured onto the floor or roof slab on the other hand.

[0053] The invention also provides a solution for the installation of such safety railings and for such a safety railing itself which is very suitable in applications where it cannot be secured in any way to an underlying or adjacent fixed structure other than to the edge formwork and the provisional floor or roof slab.

[0054] In order to better explain the characteristics of the invention, the following preferred embodiments of an assembly kit and a safety railing according to the invention, as well as a method according to the invention for the assembly of such a safety railing, are described by way of example without being limitative in any way, with reference to the accompanying figures, which:

figure 1 shows a top view of a slab element of an assembly kit according to the invention, before it is folded into a profiled slab element;

figure 2 shows an enlarged view of the section marked with F2 in figure 1;

figures 3 and 4 show, in top view, retaining elements of an assembly kit according to the invention;

figure 5 shows a section of a safety railing according to the invention on a provisional floor slab assembled with a possible embodiment of an assembly kit according to the invention, as shown in figures 1 to 4; figure 6 shows a view in perspective according to arrow F6 on the section of the safety railing of figure 5;

figure 7 shows a top view according to arrow F7 on the section of the safety railing of figure 5;

figure 8 is an enlarged view of the section marked with F8 in figure 7;

figure 9 shows a cross-section analogous to figure 5 of the section of a safety railing according to the

invention on a floor slab assembled in an alternative manner with an assembly kit according to the invention;

figure 10 shows a view in perspective according to arrow F10 of the section of the safety railing shown in figure 9;

figures 11 to 13 are cross-sections analogous to figure 5 of a section of a safety railing according to the invention on a floor slab, which in each case is assembled in yet other ways with alternative embodiments of an assembly kit according to the invention; and,

figure 14 shows a view in perspective of a safety railing according to the invention.

[0055] Figures 1 to 4 show a number of elements of an assembly kit 1 according to the invention which are intended to mount a safety railing 2 according to the invention, an example of which is shown in figure 14, on the edges 3 of a provisional floor or roof slab 4.

[0056] The assembly kit 1 is typically intended for use with such a provisional floor slab 4 which is composed of wide floor slabs, or so-called precast concrete slabs, and wherein the intention is to subsequently pour concrete on the provisional floor slab 4 in order to create a full concrete floor or full concrete roof.

[0057] In order to be able to pour this concrete on the provisional slab 4, an edge formwork 5 must be provided on the edges 3.

[0058] An assembly kit 1 according to the invention comprises elements with which both this edge formwork 5 and the safety railing 2 can be mounted in a highly efficient manner and with only very few resources.

[0059] To this end, the assembly kit 1 first and foremost includes slab elements 6 to form the edge formwork 5 on the respective edges 3 of the provisional floor or roof slab 4 or at a certain distance D therefrom.

[0060] An unfinished example of such a slab element 6 is illustrated in figures 1 and 2, in which the slab element 6 is still a flat, substantially rectangular slab element 6 that has not yet been folded into a profiled slab element 7 according to folding lines 8 and 9.

[0061] The folding lines 8 and 9 are indicated as dotted lines in figures 1 and 2 and extend parallel to each other according to the length L of the slab element 6. They laterally mark out a centrally located, rectangular section 10 of the slab element 6.

[0062] The flat slab element 6 is intended to be folded at an angle of 90° at the folding lines 8 and 9 so that it has a flat, rectangular section 11 formed by the central section 10, which is intended to form an upright side wall 12 of the edge formwork 5.

[0063] The folding line 9 forms one longitudinal edge 13 of the flat section 11 and, after the folding operation, a folded edge 14 is formed on this longitudinal edge 13, which is intended to form the upper edge 14 of the edge formwork 5.

[0064] The folding line 8 forms the opposite longitudinal

edge 15 of the flat section 11 and, after the folding operation, a flat folded edge 16 is formed on this opposite longitudinal edge 15, which can serve as a foot support or flange 16 for the upright fixing of the flat section 11 to the provisional floor slab or roof slab 4 or to an adjacent fixed structure 17.

[0065] In the case of figures 5 to 7, such an adjacent fixed structure 17 is formed, for example, by a series of juxtaposed wooden beams 18 supporting the provisional floor slab 4 and which are removed after the concrete has been poured and has sufficiently cured.

[0066] Typical dimensions of a slab element 6 or 7 may be the following:

- the length L is 2400 mm;
- the width S is 340 mm;
- the width T of the foot support 16 is 70 mm;
- the width R of the folded edge is 10 mm; and,
- the width U of the rectangular central section is 260 mm.

[0067] Of course it is not excluded from the invention to produce a slab element 6 or 7 with other dimensions.

[0068] The assembly kit 1 according to the invention includes, in addition to the slab elements 6 or 7, posts 19 which serve as upright support posts for the safety railing 2.

[0069] The assembly kit 1 further comprises for each post 19 a pair of retaining elements 20, in particular a first retaining element 21 and a second retaining element 22, with which each post 19 can be retained on the outside 23 of an edge formwork 5 formed with the slab elements 7.

[0070] A possible embodiment of such retaining elements 21 and 22 is shown in figures 3 and 4.

[0071] Each pair of retaining elements 20 herein consists of a first support plate 21 and a second support plate 22, both of which are flat.

[0072] In this case, the second support plate 22 is further provided with two folding lines 24 and 25 extending across the length of the support plate 22 concerned, but this is not necessarily the case according to the invention (see, for example, the example of figure 13).

[0073] These folding lines 24 and 25 consist, for example, of a series of elongated perforations 26.

[0074] The folding lines 24 and 25 allow the second support plate 22 to be folded into a plate-shaped element 27 with two flat ends 28 and 29 which are parallel to each other and which are connected by a flat intermediate section 30 which extends obliquely at an angle α in relation to the ends 28 and 29 of the second support plate 22.

[0075] This is clearly shown, for example, in figures 5, 11 and 12.

[0076] The first support plate 21 is never intended to be folded during use. The folding line is only intended for subsequent disassembly.

[0077] The retaining elements 21 and 22 both have an opening 32 at a first end 31, the dimensions of which

correspond to the dimensions of the cross-section of a post 19.

[0078] Preferably, the posts 19 have a circular cross-section 33, and thus the outer diameter B of such a post 19 corresponds to the diameter C of a circular opening 32 in the first end 31 of the support plates 21 and 22.

[0079] Each post 19 is further provided with a pair of protrusions 34 which are fixed to the relevant post 19, for example by welding the protrusions 34 to the latter, or by blind riveting them or removably mounting them on the relevant post 19, for example by screwing them into a threaded hole in the post 19.

[0080] The posts 19 are intended to be inserted into the openings 19 of the retaining elements 21 and 22 and rest with the protrusions 34 on the first end 31 of these retaining elements 21 and 22.

[0081] At the opening 32 in the first end 31 of a retaining element 21 or 22, one or more additional recesses 35 can be provided which are complementary or whose dimensions are greater than the dimensions of the cross-section of a protrusion 34 on a post 19, so that the post 19 with protrusions 34 can be inserted through the opening 32 with recess 35 and, after turning the post 19, can rest with the protrusions 34 against the first ends 31.

[0082] In the case of figures 3 and 4, only the second supporting plate 22 is provided with two such additional recesses 35, but it is not excluded to provide both support plates 21 and 22 with such (an) additional recess(es) 35.

[0083] The intention of the invention is that the retaining elements 21 and 22 of the assembly kit 1 can cooperate with the slab elements 7 by leaning on them to form a support for the relevant post 19.

[0084] In a preferred embodiment of an assembly kit 1 according to the invention, the retaining elements 21 and 22 and the slab elements 7 can cooperate in particular by making the retaining elements 21 and 22 extend through slots 36 to 39 provided in the plate elements 6 or 7.

[0085] It is thereby intended that the retaining elements 21 and 22 rest on an edge 40 of a corresponding slot 36 to 39 in order to form the aforementioned support for the corresponding post 19, without the retaining elements 21 and 22 being fixed to the corresponding slab element 6 or 7 of the edge formwork 5.

[0086] In order to be able to serve as a support, the support plates 21 and 22 are preferably at least 1.7 mm thick.

[0087] In other embodiments, this thickness may vary between 1 mm and 10 mm, but according to the invention, the thickness is therefore preferably greater than 1.7 mm.

[0088] For each post 19, at least one pair 41 must therefore be provided with slots 36 and 37 in the slab elements 6 or 7 of the edge formwork 5.

[0089] In the embodiments shown in the figures, however, for each post 19, two such pairs 41 and 42 are provided with slots, slots 36 and 37 and slots 38 and 39 respectively, wherein depending on the practical situation, the one pair of slots 41 or the other pair of slots 42

is preferably used to retain and support the post 19 in question, although this need not always be the case.

[0090] The first pair of slots 41 furthest from the flange 16 of the slab element 7 is used herein for mounting the retaining elements 21 and 22 high, starting from a height H in relation to the flange 16, wherein this height H corresponds to the thickness E of the provisional slab 4.

[0091] This is the case, for example, in figures 5 and 6.

[0092] The other pair of slots 42 is intended for mounting the retaining elements 21 and 22 low, wherein the lower slot 39 coincides or almost coincides with the folding line 8 or thus with the lower edge 15 of the flat section 11 of the slab element 7.

[0093] This is the case, for example, in figure 9.

[0094] The slots 36 of such a pair of slots 41 or 42 in a slab element 6 or 7 with which a pair of retaining elements 21 and 22 can cooperate to support a post 19, further extend parallel to each other in the longitudinal direction XX' of the relevant slab element 6 or 7, and thus are directed transversely to the width direction YY' of the slab element 6 or 7.

[0095] According to this width direction YY', the slots 36 to 39 are aligned.

[0096] The slots 36 to 39, for example, typically have a width V of 61 mm, just slightly larger than the width W of the support plates 21 and 22, which is, for example, 60 mm.

[0097] In order to be able to cooperate, the first end of the retaining elements 21 and 22 must be complementary to the relevant slot 36 to 39 in which it should fit.

[0098] Preferably, the retaining elements 21 and 22 according to the invention at this first end 31 are designed as a flat plate-shaped section 31 with a rectangular cross-section to that end, and each slab element 6 or 7 is provided with slots 36 to 39 having dimensions corresponding to the dimensions of the rectangular cross-section of that first end 31 of the retaining elements 21 and 22, so that the first end 31 of the retaining elements 21 and 22 can be inserted in the slab element 6 or 7 through a corresponding slot 36 to 39.

[0099] Furthermore, in order to be able to cooperate with a pair of retaining elements 21 and 22 to support a post 19, the slots 36 and 37 or 38 and 39 of such a pair of slots 41 or 42 in a slab element 6 or 7 must be spaced apart at an intermediate distance F corresponding to the distance G between the two parallel planes PP' and QQ' in which the parallel flat ends 28 and 29 of the second supporting plate 22 extend, or at an intermediate distance F corresponding to a distance G' between said two parallel planes PP' and QQ', increased by the thickness E of the used wide floor slabs or precast concrete slabs of the provisional floor or roof slab 4.

[0100] This can also be expressed the other way around, i.e. that the second support plate 22 must be folded in such a way that the distance G or G' between its flat ends 28 and 29, whether or not increased by the thickness E, is equal to the intermediate distance F between the two slots 36 and 37 or 38 and 39 of a pair of

slots 41 or 42, which of course amounts to the same thing.

[0101] In the embodiment shown in figures 1 and 2, the slab element 6 is each time provided with two pairs of slots 41 and 42 which are aligned along the width direction YY' of the slab element 6, and wherein the slots 36 and 37 or 38 and 39 of such a pair of slots 41 or 42 are located at an aforementioned intermediate distance F from each other and wherein the pairs of slots 41 and 42 are mutually located at a distance J from each other which corresponds to the thickness E of the used wide floor slabs or precast concrete slabs of the provisional floor or roof slab 4.

[0102] The intermediate distance F between the two slots 36 and 37 or 38 and 39 of a pair of slots 41 or 42 is typically 150 mm, for example.

[0103] The mutual distance J between the pairs of slots is therefore the thickness E of the provisional floor slab 4 and is typically 60 mm, for example.

[0104] Also the protrusions 34 provided on the posts 19 are located at a distance I from each other which corresponds to the aforementioned intermediate distance F between a pair of slots 36 and 37 or 38 and 39 in the slab element 6 or 7, so that they can rest with certainty on the first ends 31 of the retaining elements 21 and 22.

[0105] Figures 5 to 8 illustrate a first application of an assembly kit 1 according to the invention wherein a provisional floor slab 4 made of precast concrete slabs rests on a series of wooden beams 18.

[0106] Slab elements 6 or 7 are hereby fixed close-fitting to one another in the longitudinal direction XX' to the wooden beams at a certain distance D from the relevant edges 3 of the provisional floor or roof slab 4 by means of nails or screws 43 to form an edge formwork 5.

[0107] The flat rectangular section 11 of the profiled slab elements 7 is thereby mounted upright at the aforementioned distance D from the end sides 3 of the provisional floor or roof slab 4 by fixing the foot support or flange 16 to the underlying wooden beams 18 to form an upright side wall 12 of the edge formwork 5.

[0108] Furthermore, each post 19 of the safety railing 2 is attached to the outside 23 of the edge formwork 5 by means of a pair 20 of retaining elements 21 and 22.

[0109] A first end 31 of these retaining elements 21 and 22 is inserted through a slot 36 or 37 into a slab element 7 in order to achieve a high mounting.

[0110] The second end 44 of each retaining element 21 and 22 is fixed at the top 45 of the provisional floor or roof slab 4, each separately by means of a screw anchor 46 screwed into the provisional floor or roof slab 4.

[0111] A post 19 is then inserted in each of the pairs 20 of the provided retaining elements 21 and 22 by inserting this post 19 through the openings 32 provided in the first end 31 of the respective pair of retaining elements 21 and 22 in order to retain the post 19.

[0112] Each post 19 is herein also supported by the corresponding pair of retaining elements 21 and 22 by means of the pair of protrusions 34 provided on the post 19 or attached to the latter.

[0113] Thus the retaining elements 21 and 22 cooperate with the corresponding slab element 7 of the edge formwork 5 to form a support for the corresponding post 19 on the outside 23 of an edge formwork 5 formed with the slab elements 7, without the retaining elements 21 and 22 having to be fixed to the slab elements 7.

[0114] As illustrated in figure 14, transverse slats 47 or other elements can be fitted between the upright posts 19, for example by means of clamping devices 48 or the like, in order to finish and close the safety railing 2.

[0115] Figure 9 illustrates another application, in which posts 19 of a safety railing 2 are mounted low on the outside of an edge formwork 5 on a provisional slab 4.

[0116] The provisional floor slab 4 in this case is supported by an adjoining fixed structure 17 which is formed by an underlying wall 49 made of, for example, silicate bricks 50.

[0117] The same type of profiled slab elements 7 as in the previous case was used to create the edge formwork 5, which are fixed to the foot support or flange 16 in the underlying wall 49 by means of nails or screws 43.

[0118] The retaining elements 21 and 22 are inserted this time through the other pair 42 of slots 38 and 39 in the slab elements 7, the first support slab 21 being fixed with its second end 44 to the underside 51 of the provisional floor slab 4 this time, in this case by fixing it to the underlying wall 49 together with the foot support 16 of the slab element 7.

[0119] In other embodiments it is not excluded to fix this second end 44 to the bottom of the floor slab 4.

[0120] Both the second ends 44 of the first support slabs 21 and the foot support or flange 16 of the slab elements 7 in this case extend underneath the provisional floor slab 4, which can be achieved, for example, by mounting the edge formwork 5 first and by installing the provisional floor slab 4 only afterwards.

[0121] The second support plate 22 has an intermediate section 30 which is slightly less inclined at an angle α' which is somewhat smaller, since in this case only the distance G' corresponding to the distance F between the slots 38 and 39, minus the thickness E of the floor slab 4, needs to be bridged.

[0122] The end 44 of these second support plates 22 is still attached to the top 45 of the provisional floor slab 4 by means of a turnbuckle 46.

[0123] The posts 19 are further mounted in exactly the same manner as in the previous example.

[0124] Figure 11 shows yet another application, wherein another embodiment of an assembly kit 1 according to the invention is used this time.

[0125] More specifically, the slab metal elements 7 are still profiled slab elements 7 with a flat rectangular section 11 forming the upright side wall 12 of the edge formwork 5, but wherein only one longitudinal edge 13 of the flat section 11 is folded into a folded edge 14 which is intended to form the upper edge of the edge formwork 5, while no flange or foot support 16 is provided this time.

[0126] In this case, the edge formwork 5 is no longer

provided at a distance D from the end edges 3 of the provisional floor slab 4, but the flat rectangular section 11 of the profiled slab elements 7 is mounted upright by fixing it directly at the opposite edge 15 to these end sides 3 of the floor slab 4 so as to form an upright side wall 12 of the edge formwork 5.

[0127] For said fixing, use is made of clamping sleeves 52 which extend through the slab elements 7 and are fixed in the end edges 3 of the provisional floor slab 4.

[0128] A major difference with the preceding embodiments is that the edges 3 of the provisional floor slab 4 have to be placed at once in the correct final position during its installation, with little or no possibility of adjusting minor deviations.

[0129] The support plates 21 and 22 are both jointly attached with their second ends 44 by means of only one turnbuckle 46 at the top 45 of the provisional floor slab 4.

[0130] The other end 31 of support plates 21 and 22 is inserted again through the slots 36 and 37 in the slab element 7, and the post 19 is suspended in the openings 32 in this end, again with the support plates 21 and 22 resting on an edge 40 of the relevant slots 36 and 37.

[0131] Figure 12 shows another application which is in a way a variant of the application shown in figure 9, but in which the provisional floor slab 4 rests on an underlying wall 49 this time which has been built from fast-building blocks 53.

[0132] Nailing or screwing the foot supports or flanges 16 of the slab elements 7 from the top into the wall 49 is not an option in this case.

[0133] These foot supports or flanges 16 as well as the first support plate 21 extend against the underside 51 of the provisional floor slab 4.

[0134] The first support plate 21 is longer in this embodiment, and its second end 44 is folded at right angles in relation to the other section 54 so that it forms an angle 55 which corresponds to the angle 56 formed between the top surface 57 of the wall 49 and the inner surface 58 of the wall 49.

[0135] The other support plate 22 is attached to the top 45 of the provisional floor slab 4, and posts 19 are further provided in a completely analogous manner as in the preceding cases.

[0136] Finally, figure 13 illustrates yet another application wherein the provisional floor slab 4 is composed of concrete vaults 59 this time.

[0137] In this embodiment, both support plates 21 and 22 are flat, because the thickness E of the concrete vaults 59 is substantially larger and varies, for example, between 13 cm and 35 cm.

[0138] It is therefore sufficient to fix the second end 44 of one of both retaining elements or support plates 22 of the pair of retaining elements 20 to the top 45 of the provisional floor or roof slab 4, for example by means of a clamping sleeve 52, and the second end 44 of the other retaining element or support plate 21 of the pair of retaining elements 20 to the underside 51 of the floor or roof slab 4, for example by means of clamping sleeves 52

and/or turnbuckles 46.

[0139] In this way, a sufficiently large intermediate distance Z is obtained between the first ends 31 of the support plates 21 and 22 for retaining posts 19, since this intermediate distance Z corresponds to the thickness E of the floor slab 4, which is much larger in this application.

[0140] The foot support 16 of the slab elements is also fixed to the underside 51 of the provisional floor slab 4, for example by means of clamping sleeves 52 and/or turnbuckles 46.

[0141] The mounting of poles 19 is again completely analogous to what has already been explained above.

[0142] The invention is by no means limited to the embodiments of an assembly kit 1 and a safety railing 2 according to the invention described by way of example and illustrated in the figures; on the contrary, such an assembly kit 1 and such a safety railing 2 can be realized in many other ways while still remaining within the scope of the invention.

[0143] The invention is by no means limited to the embodiments of a method according to the invention for mounting a safety railing 2, described by way of example and illustrated in the figures; on the contrary, such a method can be carried out in many other ways while still remaining within the scope of the invention.

Claims

1. Safety railing (2) of a construction site provided on one or several edges (3) of a provisional floor or roof slab (4), composed for example of wide floor slabs or so-called precast concrete slabs, or of concrete vaults, **characterised in that** posts (19) serving as upright support posts of the safety railing (2) are each retained and supported by a pair (20) of retaining elements (21, 22) on the outside of an edge formwork (5) formed on the respective edges (3) of the provisional floor or roof slab (4) or at a certain distance (D) therefrom by means of slab elements (6, 7), wherein the retaining elements (21, 22) and the slab elements (6, 7) cooperate as the retaining elements (21, 22) extend through slots (36-39) in the slab elements (6, 7) and rest there on an edge (40) of a respective slot (36-39) so as to form a support for the corresponding post (19), without the retaining elements (21, 22) being fixed to the slab element (6, 7) concerned of the edge formwork (5), wherein the retaining elements (21, 22) are designed as support plates with a first end (31) and a second end (44), wherein the support plates (21, 22) are both jointly attached with their second ends (44) by means of only one turnbuckle (46) to the top (45) of the provisional floor slab (4) or wherein the second end (44) of one of both retaining elements or support plates (22) of the pair of retaining elements (20) is fixed to the top (45) of the provisional floor or roof slab (4) and wherein the second end (44) of the other retain-

ing element or support plate (21) of the pair of retaining elements (20) is fixed to the underside (51) of the floor or roof slab (4).

2. Safety railing (2) according to claim 1, **characterised in that** the slab elements (6, 7) of the edge formwork (5) are profiled slab elements (7) with a flat, rectangular section (11) forming the upright side wall (12) of the edge formwork (5), wherein the flat, rectangular section (11) of the profiled slab elements (7) is mounted upright by fixing it directly against the end sides (3) of the floor slab (4) on a longitudinal edge (15) so as to form an upright side wall (12) of the edge formwork (5). 5 10
3. Safety railing (2) according to claim 1, **characterised in that** the slab elements (6, 7) of the edge formwork (5) have a flat, rectangular section (11), designed to form an upright side wall (12) of the edge formwork (5), and **in that** a flat, folded section (16) is formed on a longitudinal edge (15) which can serve as a foot support or flange (16) for attaching the flat section (11) upright to the provisional floor slab or roof slab (4). 15 20
4. Safety railing (2) according to claim 2, **characterised in that** the retaining means (21, 22) are designed as support plates with a first end (31) and a second end (44), wherein the support plates (21, 22) are both jointly attached with their second end (44) to the top (45) of the provisional floor slab (4) by means of only one turnbuckle (46). 25 30
5. Safety railing (2) according to claim 3, **characterised in that** the retaining means (21, 22) are designed as support plates with a first end (31) and a second end (44), wherein the second end (44) of one of both retaining elements or support plates (22) of the pair of retaining elements (20) is fixed to the top (45) of the provisional floor or roof slab (4) and wherein the second end (44) of the other retaining element or support plate (21) of the pair of retaining elements (20) is fixed to the underside (51) of the floor or roof slab (4). 35 40
6. Safety railing (2) according to claim 5, **characterised in that** the foot support (16) of the slab elements (6, 7) is also attached to the underside (51) of the provisional floor slab (4). 45 50
7. Assembly kit (1) for mounting a safety railing (2) on a construction site according to any one of the preceding claims, in particular on one or several edges (3) of a provisional floor or roof slab (4), composed for example of wide floor slabs, or so-called precast concrete slabs, or of concrete vaults, **characterised in that** the assembly kit (1) comprises at least the following elements; 55

- one or several slab elements (6, 7) to form an edge formwork (5) on the respective edges (3) of the provisional floor or roof slab (4) or at a certain distance (D) therefrom;

- posts (19) serving as upright support posts of the safety railing (2); and,

- for each post (19), a pair of retaining elements (20) with which each post (19) can be retained on the outside (23) of an edge formwork (5) formed with the slab elements (6, 7) and which can cooperate with the slab elements (6, 7) by resting on the latter so as to form a support for the respective post (19), wherein the retaining elements (21, 22) and the slab elements (6, 7) can cooperate by making the retaining elements (21, 22) extend through slots (36-39) provided in the slab elements (6, 7) and by making them rest on an edge (40) of a respective slot (36-39) so as to form a support for a respective post (19), without the retaining elements (21, 22) having to be fixed to the respective slab element (6, 7) of the edge formwork (5), wherein the retaining elements (21, 22) are designed as support plates with a first end (31) and a second end (44), wherein the support plates (21, 22) are both designed to be jointly attached with their second end (44) to the top (45) of the provisional floor slab (4) by means of only one turnbuckle (46) or to fix the second end (44) of one of both retaining elements or support plates (22) of the pair of retaining elements (20) to the top (45) of the provisional floor or roof slab (4) and to fix the second end (44) of the other retaining element or support plate (21) of the pair of retaining elements (20) to the underside (51) of the floor or roof slab (4).

8. Assembly kit (1) according to claim 7, **characterised in that** the retaining elements (21, 22) are provided at a first end (31) with a flat plate-shaped section (31) having a rectangular cross section and wherein each slab element (6, 7) is provided with one or several pairs of parallel slots (41, 42) which can cooperate with a pair of retaining elements (21, 22), wherein these slots (36-39) are complementary to the aforesaid first end (31) of the retaining elements (21, 22) and have dimensions to that end corresponding to the dimensions of the rectangular cross section of that first end (31), so that the first end (31) of the retaining elements (21, 22) can be inserted through a respective slot (36-39) in the slab element (6, 7). 45 50
9. Assembly kit (1) according to claim 8, **characterised in that** the slots (36-39) of such pair of slots (41, 42) in a slab element (6, 7) with which a pair of retaining elements (21, 22) can cooperate to support a post (19), extend parallel to each other in the longitudinal 55

direction (XX') of the respective slab element (6, 7), are directed transversely to the width direction (YY') of the slab element (6, 7) and are aligned with respect to each other along this width direction (YY').

10. Assembly kit (1) according to one or several of claims 7 to 9, **characterised in that** each pair of retaining elements (20) consists of a first support plate (21) and a second support plate (22) having a flat design, and wherein the second support plate (22) is provided with two folding lines (24, 25) extending transversely along the length of the plate (21, 22) concerned and consisting for example of a series of elongated perforations (26), the folding lines (24, 25) making it possible to fold the second support plate (22) into a plate-shaped element (27) with two flat ends (28, 29) which are parallel and which are connected to each other by means of a flat, intermediate section (30) extending obliquely at an angle (α) in relation to the ends (28, 29) of the second support plate (22).

11. Assembly kit (1) according to claim 10, **characterised in that** the slots (36-39) of such a pair of slots (41, 42) in a slab element (6, 7) with which a pair of retaining elements (20) can cooperate so as to support a post (19), are situated at an intermediate distance (F) from each other which corresponds to the distance (G) between the two parallel planes (PP', QQ') in which the parallel flat ends (28, 29) of the second support plate (22) extend, or at an intermediate distance (F) which corresponds to said distance (G') between the two parallel planes (28, 29), plus the thickness (E) of the used wide floor slabs or precast concrete slabs of the provisional floor or roof slab (4).

12. Assembly kit (1) according to claim 11, **characterised in that** a slab element (6, 7) is each time provided with two pairs of slots (41, 42) aligned according to the width direction (YY') of the slab element (6, 7) and wherein the slots (36-39) of such a pair (41, 42) are situated at an intermediate distance (F) from one another and the pairs of slots (41, 42) are situated at a mutual distance (J) which corresponds to the thickness (E) of the used wide floor slabs or precast concrete slabs of the provisional floor or roof slab (4).

13. Assembly kit (1) according to one or several of the preceding claims 7 to 12, **characterised in that** the retaining elements (21, 22) are provided with an opening (32) at a first end (31) whose dimensions (C) correspond to the dimensions (B) of the cross-section of a post (19).

14. Assembly kit (1) according to claim 13, **characterised in that** each post (19) is provided with a pair of

protrusions (34) which are fixed to the post (19) or which are removably mounted on the post (19) and which are situated at a distance (I) from each other corresponding to the aforesaid intermediate distance (F) between a pair of slots (36-39) in the slab element (6, 7).

15. Assembly kit (1) according to claim 14, **characterised in that** at the opening (32) in the first end (31) of a retaining element (21, 22) is provided an additional recess (35) which is complementary or whose dimensions are larger than the dimensions of the cross-section of a protrusion (34) on a post (19), so that the post (19) can be inserted through the opening (32), protrusion (34) included.

16. Assembly kit (1) according to one or several of the preceding claims 7 to 15, **characterised in that** a slab element (6, 7) is a profiled plate element (7) having a flat, rectangular section (11) designed to form an upright side wall (12) of the edge formwork (5), wherein at least on one longitudinal edge (13) of the flat section (11) there is a folded edge (14) designed to form the top edge of the edge formwork (5) and wherein, optionally, on the opposite longitudinal edge (15) of the flat section (11), a flat folded section (16) is provided which can serve as foot support or flange (16) for the upright attachment of the flat section (11) to the floor slab (4) or roof slab or to an adjacent fixed structure (17).

17. Method for building a safety railing (2) on a construction site, in particular on one or several edges (3) of a provisional floor or roof slab (4), wherein the method consists of the following steps;

- fixing one or several retaining elements (6, 7) to the relevant edges (3) of the provisional floor or roof slab (4) or at a certain distance (D) therefrom so as to form an edge formwork (5);
- providing pairs of slots (41, 42) in the slab elements (6, 7);
- providing pairs of retaining elements (20), wherein a first end (31) thereof is inserted through an aforesaid slot (36-39) in a slab element (6, 7) and the second end (44) is fixed to the top (45) or the underside (51) of the floor or roof slab (4) or to an adjacent fixed structure (17);
- arranging a post (19) in each of the pairs of provided retaining elements (20), each post (19) serving as an upright support post of the safety railing (2), wherein such a post (19) is inserted through openings (32) that are provided in the first end (31) of the respective pair of retaining elements (21, 22) so as to retain the post (19); and,
- making each post (19) rest on the correspond-

ing pair of retaining elements (21, 22) by means of a pair of protrusions (34) that are provided on the post (19) or are fixed to the latter, wherein the retaining elements (21, 22) thus cooperate with the respective slab element (6, 7) of the edge formwork (5) so as to form a support for the respective post (19) on the outside (23) of an edge formwork (5) formed with the slab elements (6, 7), wherein the retaining means (21, 22) are designed as support plates with a first end (31) and a second end (44), wherein the support plates (21, 22) are both jointly attached with their second end (44) to the top (45) of the provisional floor slab (4) by means of only one turnbuckle (46) or wherein the second end (44) of one of both retaining elements or support plates (22) of the pair of retaining elements (20) is fixed to the top (45) of the provisional floor or roof slab (4) and wherein the second end (44) of the other retaining element or support plate (21) of the pair of retaining elements (20) is fixed to the underside (51) of the floor or roof slab (4).

18. Method according to claim 17, **characterised in that** it consists of the following steps:

- using profiled slab elements (7) with a flat, rectangular section (11) provided with a flat, folded section (16) which can serve as foot support or flange (16); and,
- mounting the flat, rectangular section (11) of the profiled slab elements (7) upright at a certain distance (D) from the end sides (3) of the provisional floor or roof slab (4) by fixing the foot support or flange (16) to an adjacent fixed structure (17), such as an underlying wooden beam (18) or underlying retaining wall (49) so as to form an upright side wall (12) of an edge formwork (5).

19. Method according to claim 18, **characterised in that** it consists of the following steps:

- using profiled slab elements (7) with a flat, rectangular section (11) and wherein one longitudinal edge (13) of the flat section (11) is a folded edge (14) designed to form the top edge of the edge formwork (5); and,
- mounting the flat, rectangular section (11) of the profiled slab elements (7) upright by fixing it at the opposite edge (15) against the end sides (3) of the floor slab or roof slab (4) so as to form an upright side wall (12) of an edge formwork (5).

20. Method according to one or several of the preceding claims 17 to 19 included, **characterised in that** the second end (44) of both retaining elements (21, 22) of an aforesaid pair of retaining elements (20) is fixed to the top (45) of the floor or roof slab (4).

21. Method according to one or several of the preceding claims 17 to 20 included, **characterised in that** the second end (44) of one of both retaining elements (22) of an aforesaid pair of retaining elements (20) is fixed to the top (45) of the floor or roof slab (40) and the second end (44) of the other retaining element (21) of that pair of retaining elements (20) is fixed to the underside (51) of the floor or roof slab (4) or to an adjacent fixed structure (17).

22. Method according to claims 20 and 21, **characterised in that** the second end (44) of both retaining elements (21, 22) of an aforesaid pair of retaining elements (20) is fixed to the top (45) of the floor or roof slab (4) by means of a single common clamping means (46, 52).

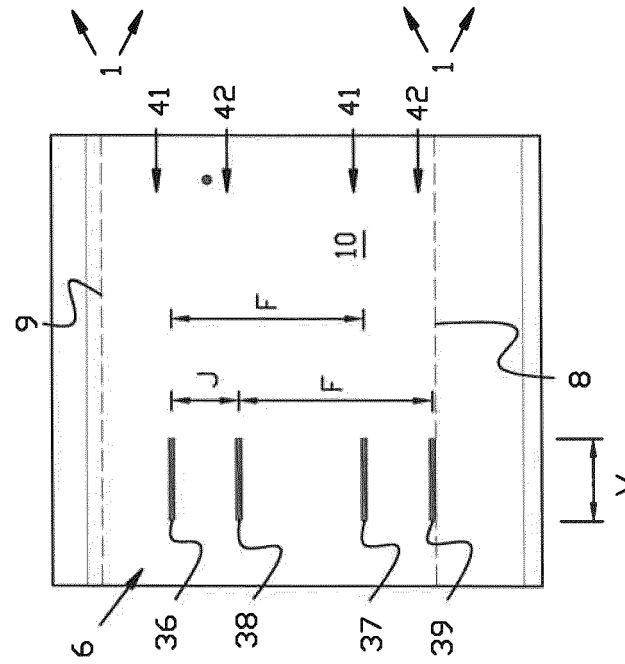
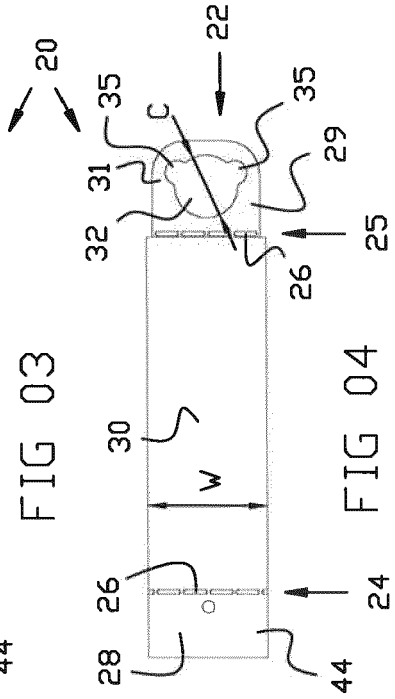
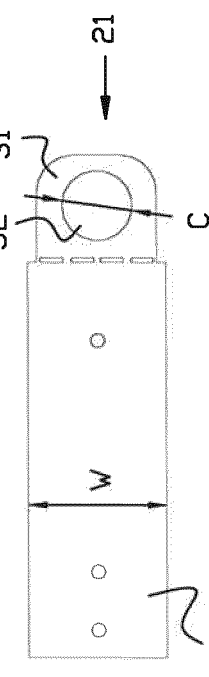
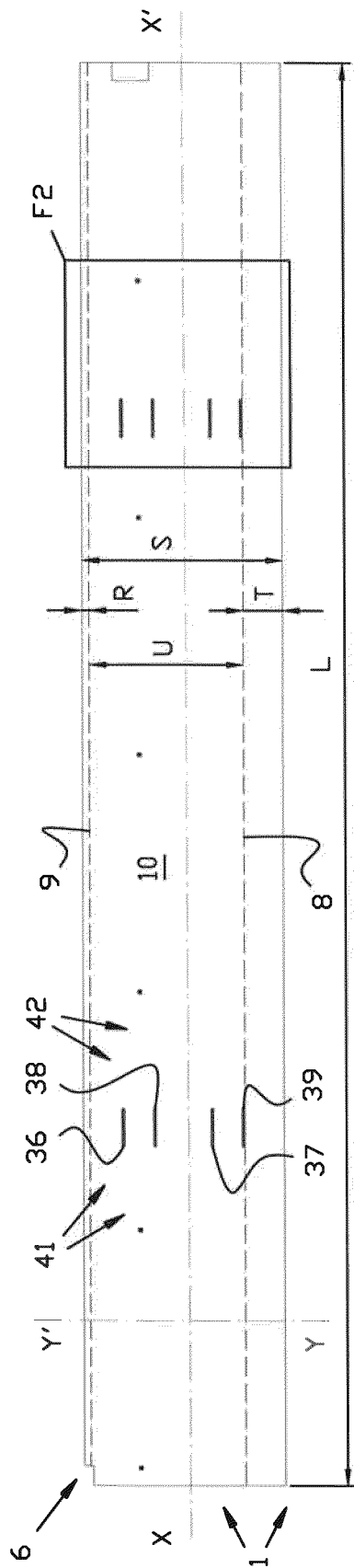


FIG 01

FIG 02

FIG 03

FIG 04

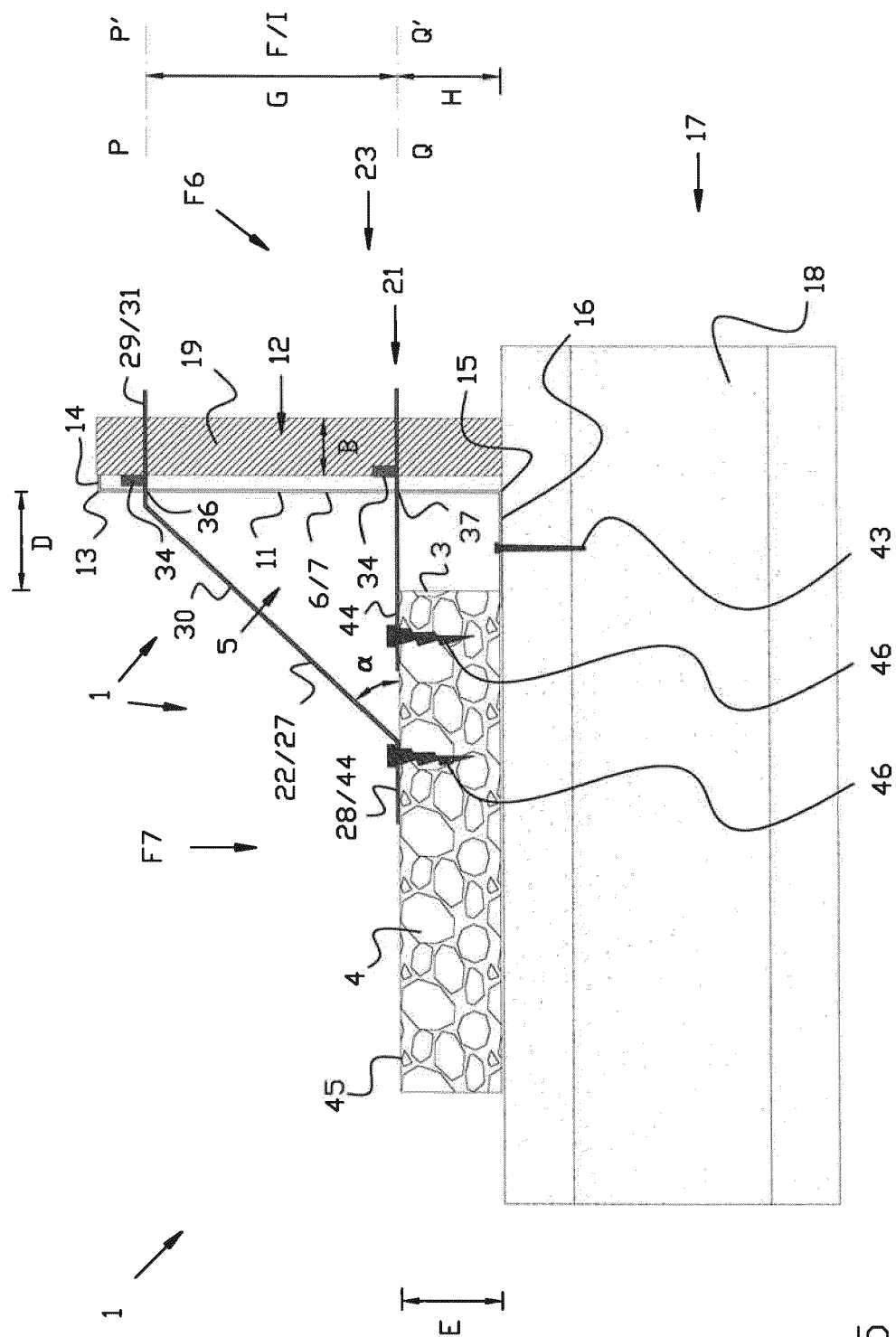
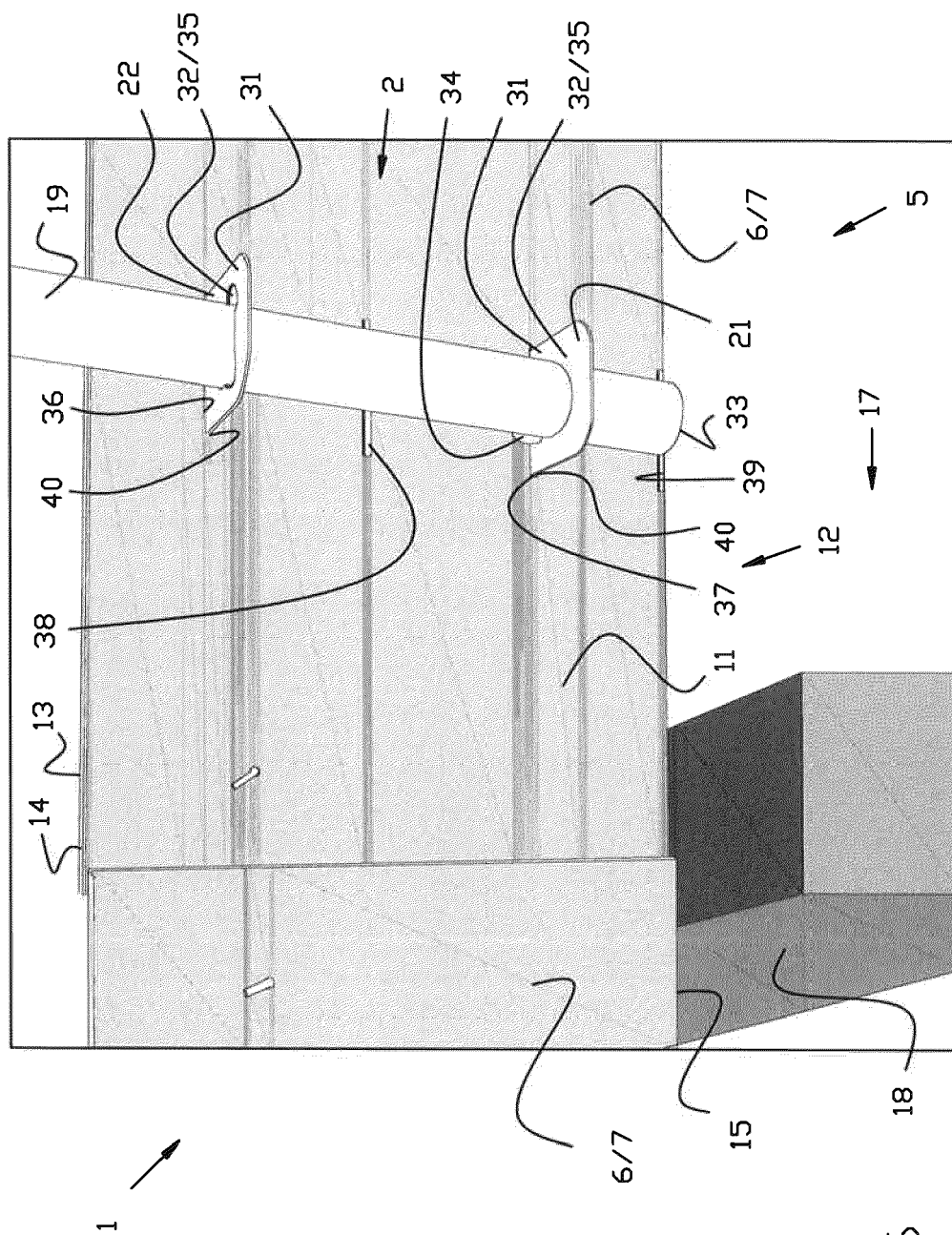
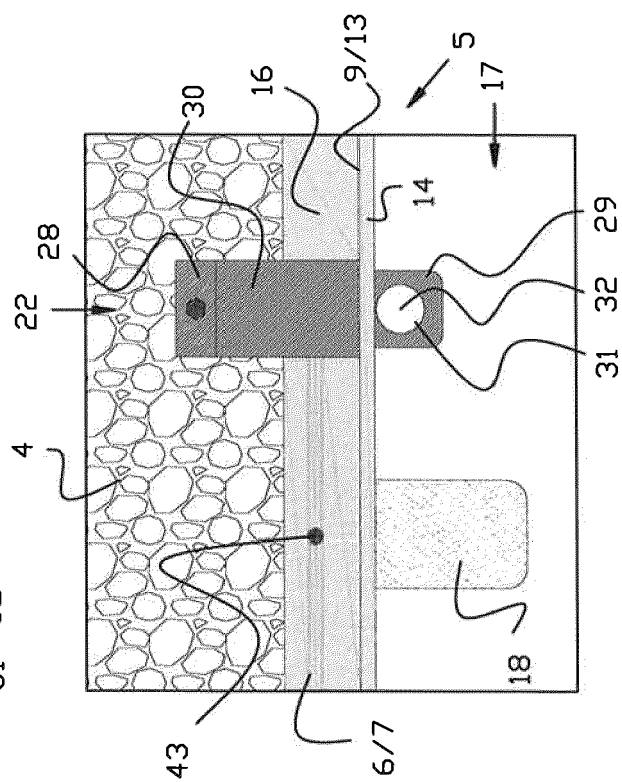
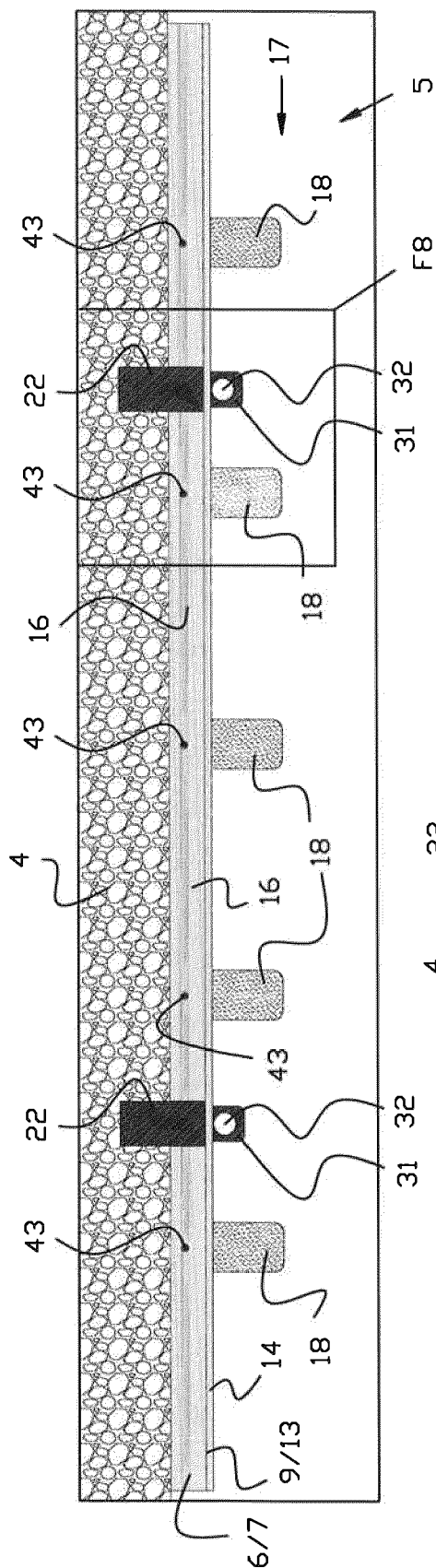


FIG 05





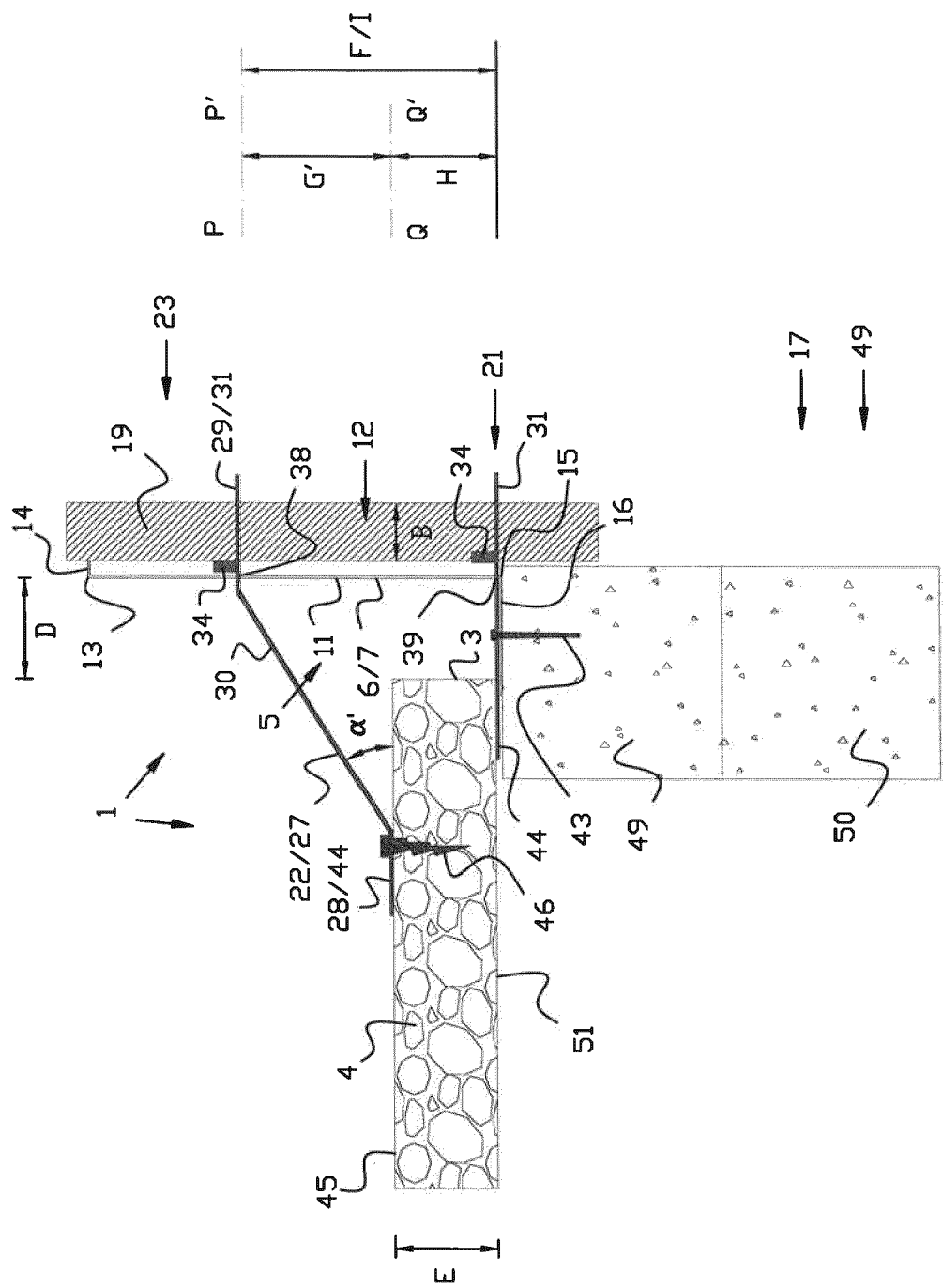
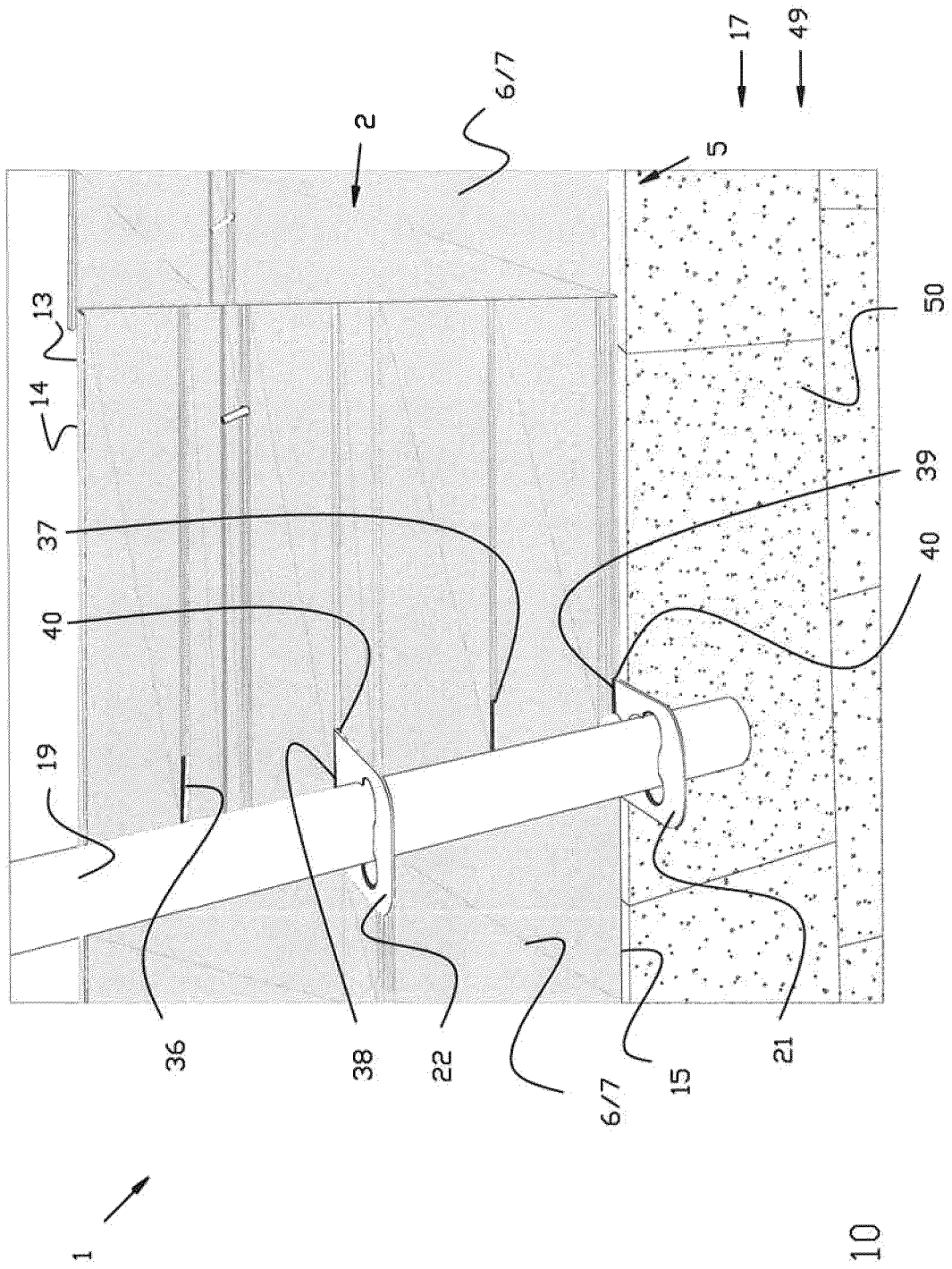


FIG 09



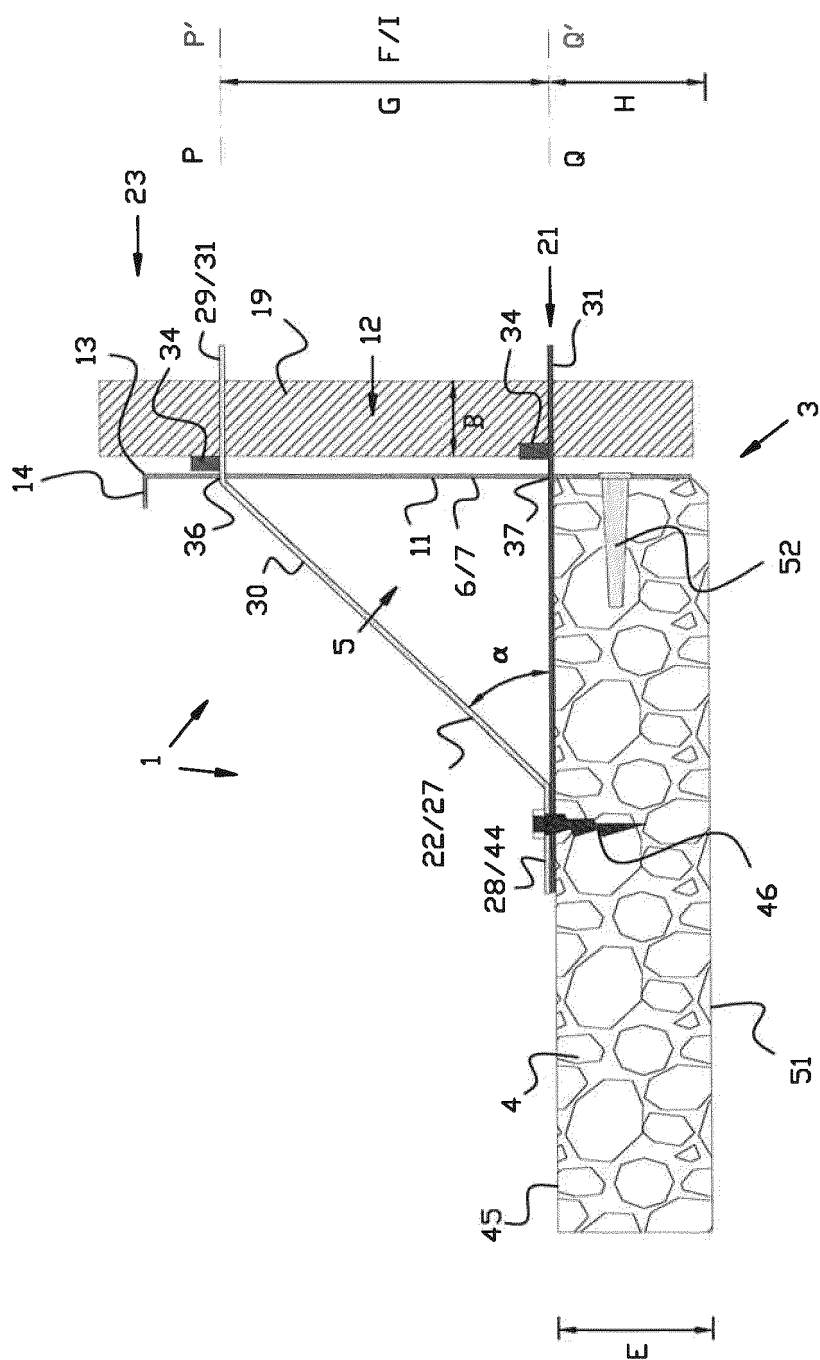


FIG 11

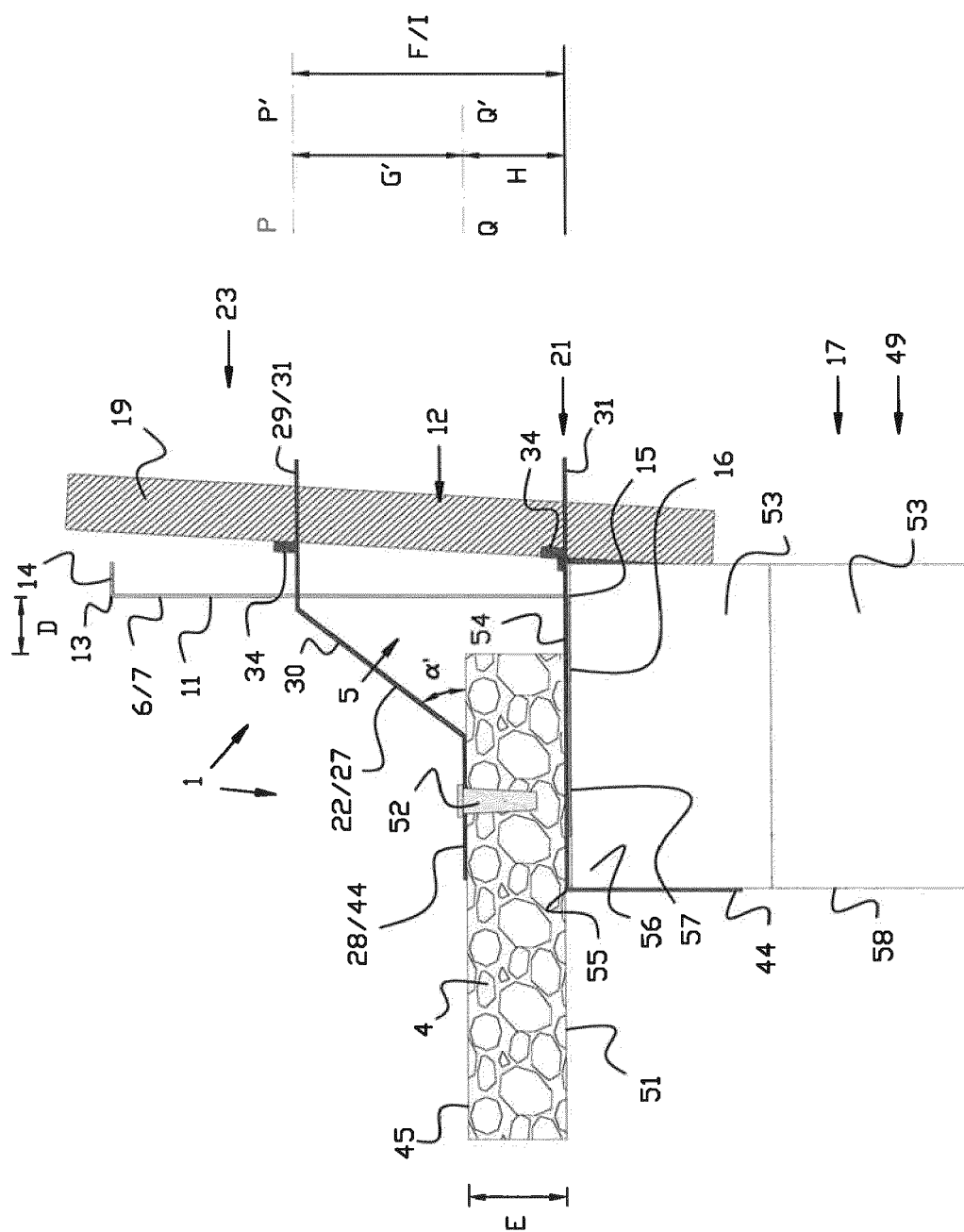


FIG 12

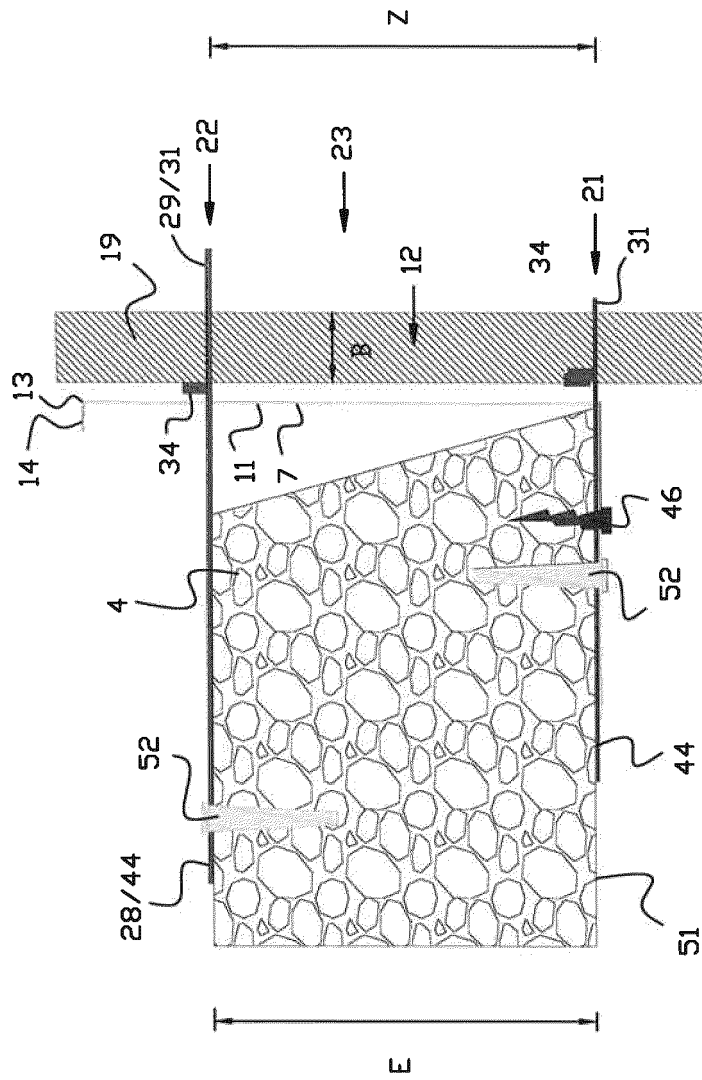
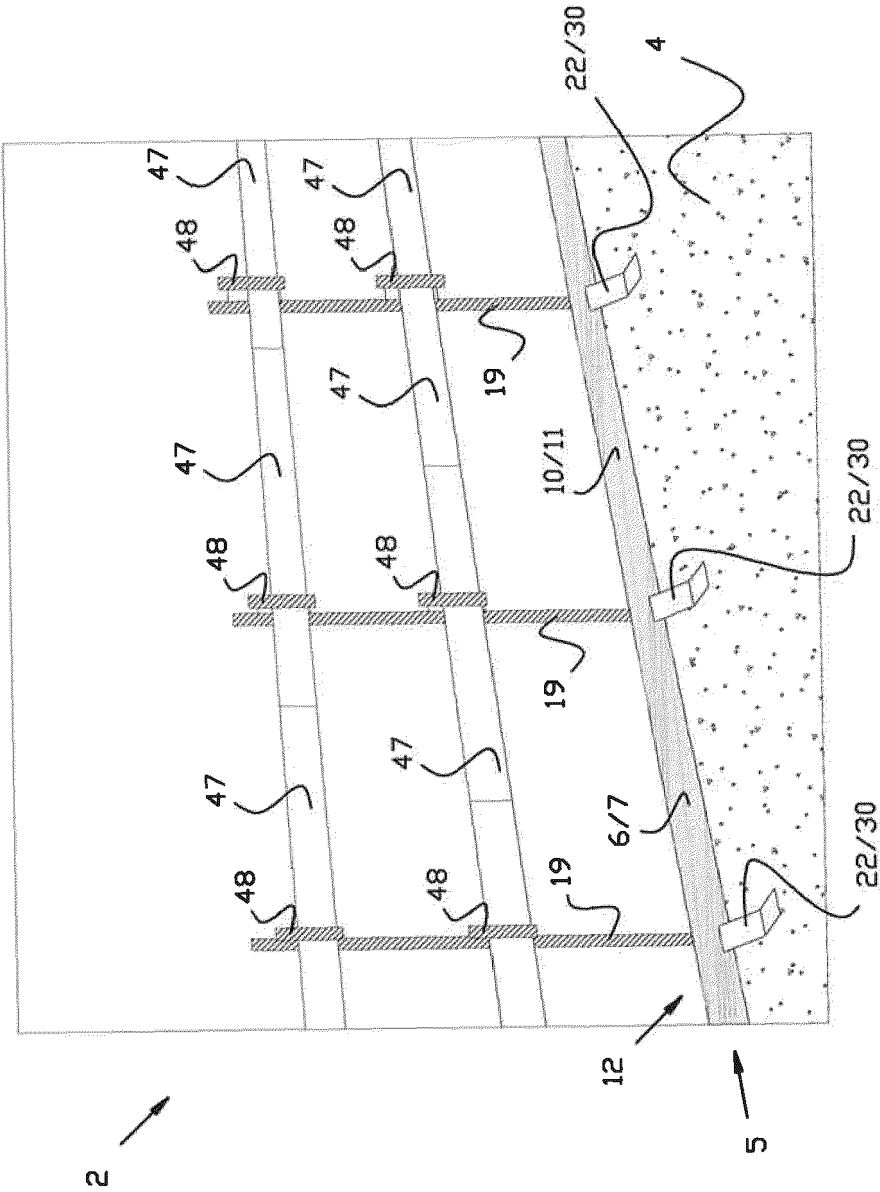


FIG 13





EUROPEAN SEARCH REPORT

Application Number
EP 20 21 0079

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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	GSS BVBA: "3000 GSS Safe", 14 December 2018 (2018-12-14), page 1, XP054980753, Retrieved from the Internet: URL:https://www.youtube.com/watch?v=V-FMb98vr0I [retrieved on 2020-08-06] * the whole document *	1-22	INV. E04G11/36 E04G21/32
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			E04G
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 16 March 2021	Examiner Manera, Marco
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**ANNEX TO THE EUROPEAN SEARCH REPORT
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5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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16-03-2021

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