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(54) **EDGE BARRIER ELEMENT**

(57) The invention relates to an edge barrier element for use in building construction or the like. The edge barrier element (1) is rectangular and has a first and a second horizontal edge (2, 2'), which are parallel to each other, and a first and a second vertical edge (3, 3'), which are parallel with each other and perpendicular to the first and second horizontal edge (2, 2'). The barrier element (1) further comprises a plurality of first steel wires (4, 4', 4''), which are arranged to connect the first and the second horizontal edge (2, 2'), and which are parallel with the first and the second vertical edge (3, 3') and between

them, as well as a plurality of second steel wires (5, 5', 5''), which are arranged on a first side of the first steel wires (4, 4', 4''), perpendicular to them and attached to them by welding. Furthermore, at least on the first and second horizontal edge (2, 2') third steel wires (6, 6') are arranged at a second side of the first steel wires (4, 4', 4''), so that the third steel wires (6, 6') are essentially opposite and parallel to corresponding second steel wires (5, 5', 5'') on the first side of the first steel wires (4, 4', 4'').

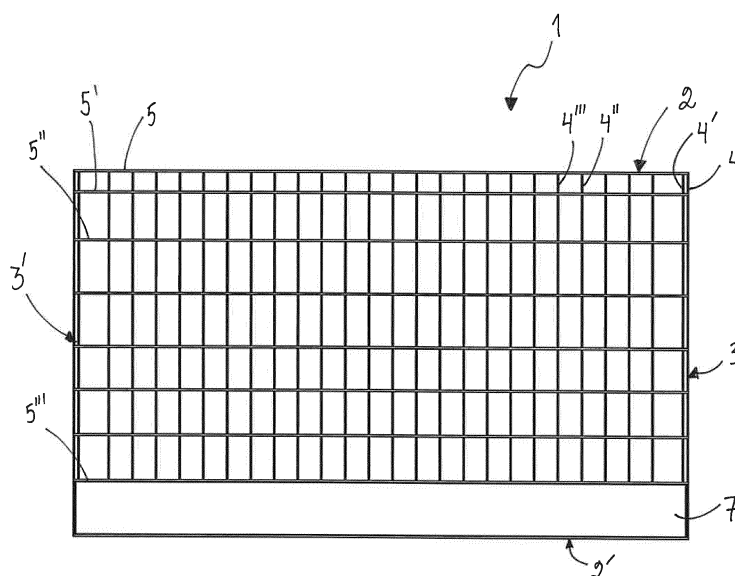


FIG. 1A

Description

[0001] The present invention relates to an edge barrier element according to the preamble of enclosed independent claim.

[0002] Edge barrier elements are used in building construction and other elevated sites in order to prevent falls from scaffolding or the like. The edge barrier elements are arranged on the free edge of the scaffolding, where they form an obstacle for workers and tools and prevent them from falling down to a lower level. The edge barrier elements are thus used for temporary fall protection, which means that they should be easy and quick to install, adjustable and lightweight. Because the same edge barrier elements are used at different construction sites they are moved from one construction site to the following. This requires that the edge barrier elements can be effectively packed for the transport, taking as little space as possible. Naturally the edge barrier elements must fulfil the security requirements, such as standard EN13374, be strong and prevent accidental falls from elevated levels.

[0003] There is a constant need to improve the properties of the edge barrier elements, to make them easier to manufacture, transport and assembly.

[0004] An object of this invention is to minimise or even eliminate the disadvantages existing in the prior art.

[0005] An object of the present invention is to provide an edge barrier element which has a simple construction but which fulfils the safety and strength requirements.

[0006] Another object of the present invention is an edge barrier element which is easy to manufacture and pack for transport between construction sites.

[0007] These objects are attained with a method and an arrangement having the characteristics presented below in the characterising parts of the independent claims.

[0008] Typical edge barrier element according to the present invention for use in building construction or the like is rectangular and has a first and a second horizontal edge, which are parallel to each other, and a first and a second vertical edge, which are parallel with each other and perpendicular to the first and second horizontal edge. The barrier element further comprises

- a plurality of first steel wires, which are arranged to connect the first and the second horizontal edge, and which are parallel with the first and the second vertical edge and between them,
- a plurality of second steel wires, which are arranged on a first side of the first steel wires, and which are perpendicular to them and attached to them by welding, whereby

at least on the first and second horizontal edge third steel wires are arranged at a second side of the first steel wires, so that the third steel wires are essentially opposite and parallel to second steel wires on the first side of the first steel wires.

[0009] Now it has been surprisingly found out that the stability and strength of the edge barrier element is significantly improved when third steel wires are arranged on the second side of the first steel wires, i.e. on the second side of the edge barrier element. It was realised that when the vertical first steel wires are supported by and attached to the horizontal second and third steel wires on both sides, the constructional strength of the edge barrier element is increased in unexpected manner. The edge barrier element keeps its shape significantly better and is not distorted so easily. The present invention also makes it possible to make lighter edge barrier elements while maintaining the required security aspects. Handling and transportation of light edge barrier elements is easier and more cost effective.

[0010] The horizontal third steel wires are arranged on the second side of the edge barrier element so that the vertical first steel wires become located between the second and the third steel wires. In other words, the second steel wires are located on the first side of the edge barrier element and the third steel wires are located on the second side of the edge barrier element. Second and third wires are opposite to each other, i.e. they are placed one upon another and they cross the first steel wires at same locations. The second and the third steel wires are attached to the first steel wires by welding. The second and third wires also form the first and second horizontal edges of the edge barrier element.

[0011] According to one preferred embodiment of the present invention the edge barrier element barrier element is essentially planar. This means that the edge barrier element does not contain any parts, such as edge strips or the like, that are extending or protruding from the planar general surface of the edge barrier element. The present invention increases the structural stability of the edge barrier element so much that the bent edge areas, known from some prior art barrier elements, can be excluded. The planar shape of the edge barrier element makes it possible to pack them closer to each other during the transport, whereby one transport unit can carry a larger number of individual elements. This saves transport space as well as transport costs. Furthermore, packing of the edge barrier elements is improved, because the elements can be packed to the transport frame without any regard to their vertical direction. Also the handling of the edge barrier elements at the building site is also simplified as the elements may be installed or mounted with either side facing outwards.

[0012] The edge barrier element has preferably the following property:

[0013] The edge barrier element does not deflect more than 55 mm 1) when a point load, 300 x 300 mm, of 200 N is applied on the weakest point of the toeboard level, and/or 2) when a point load, 300 x 300 mm, of 300 N is applied on the weakest point of the guardrails level. Guardrail level is here understood to be on the middle of the edge barrier element in horizontal direction. The measurement results are given as an average of 4 tests,

whereby no single reading shall exceed 60 mm.

[0014] According to one embodiment the number of third steel wires on the second side of the first steel wires, i.e. on the second side of the edge barrier element, is the same as the number of second steel wires on the first side of the first steel wires, i.e. on the first side of the edge barrier element, and that the third steel wires and the second steel wires are essentially opposite and parallel to each other. This means that for each horizontal second steel wire there is a horizontal third steel wire placed on the same identical location on the second side of the first steel wires. This embodiment provides an edge barrier element with elevated structural stability.

[0015] According to another embodiment of the invention third steel wires are arranged on the second side of the first steel wires and essentially opposite and parallel to corresponding second steel wires only on a horizontal edge area, which extends 0.0 - 0.4 m, preferably 0.0 - 0.25 m, sometimes 0.01 - 0.25 m, from the first and/or the second horizontal edge towards the centre of the barrier element. This means that horizontal second and third wires are arranged on opposite sides of the first steel wires solely on horizontal edge areas of the edge barrier element. It has been observed that in this manner an adequate structural stability is obtained and the barrier element is easier and cheaper to manufacture. Furthermore, in this manner the edge barrier element is lighter in weight, which makes its handling easier e.g. during transport and assembly.

[0016] The distance between the adjacent vertical first steel wires may be constant in whole edge barrier element. The distance between adjacent first steel wires may be in the range of 0.015 - 0.25 m, preferably 0.017 - 0.109 m. The distance is calculated from the centre of the wire to the centre of the nearest adjacent wire.

[0017] According to one preferred embodiment the distance between the adjacent first steel wires decreases from the first and second vertical edge towards the centre of the barrier element. This means that the mesh size of the barrier element decreases towards the centre of the barrier element. In this manner the edge barrier element has more strength and has better impact-absorbing properties. According to one preferable embodiment the distance between the first steel wires decreases gradually or step-wise. Stepwise means that the adjacent first steel wires may have the same distance for a few intervals until the distance decreases towards the centre of the edge barrier element. Alternatively the decrease may be constant, i.e. towards the centre of the barrier element each distance between two adjacent vertical steel wires is smaller than the preceding distance towards the nearest vertical edge. For example, the distance between two adjacent first steel wires, may be in the range of 0.015 - 0.25 m, preferably 0.017 - 0.109 m at the first and the second vertical edge and/or the distance between two adjacent first steel wires may be in the range 0.015 - 0.25 m, preferably 0.017 - 0.109 m at the centre of the barrier element, however so that the distance is shorter in the

centre of the element than at the edge area. The distance is calculated from the centre of the wire to the centre of the nearest adjacent wire.

[0018] The distance between the adjacent horizontal steel wires, the second and third steel wires, may be constant in whole edge barrier element. The distance between adjacent horizontal steel wires may be in the range of 0.02 - 0.25 m, preferably 0.075 - 0.195 m. The distance is calculated from the centre of the wire to the centre of the nearest adjacent wire. According to one preferred embodiment the distance between the horizontal steel wire at the first and/or second horizontal edge of the barrier element and the adjacent horizontal steel wire towards the centre of the barrier element is shorter than the distance between other adjacent horizontal steel wires. This means that the distance between the adjacent second steel wires decreases from the first and second horizontal edge towards the centre of the barrier element. The decrease may be constant, i.e. towards the centre of the barrier element each distance between two adjacent horizontal steel wires is smaller than the preceding distance towards the nearest horizontal edge. This makes the horizontal edges of the edge barrier element more stable.

[0019] A toeboard may be permanently or detachably attached to one of the horizontal edges of the edge barrier element. Purpose of the toeboard is i.a. to prevent the tools from falling to a lower level or to the ground. Often the toeboard shows the name of the constructor or other relevant information. According to one embodiment the edge barrier element comprises at the second vertical edge a toeboard, which comprises at least a first toeboard part arranged on the first side of the first steel wires, i.e. on the first side of the edge barrier element, and at least a second toeboard part, arranged on the second side of the first steel wires, i.e. on the second side of the edge barrier element. When the toeboard is made of at least two toeboard parts, located at different sides of the edge barrier element, the information on the toeboard is easily visible on both sides of the edge barrier element. It is also possible that the toeboards and their information content are different on different sides of the barrier element.

[0020] The diameter of the first steel wires may be at least 3 mm, preferably in the range of 4.0 - 6.0 mm, more preferably 4.5 - 5.0 mm. The diameter of the second steel wires is at least 4 mm, preferably in the range of 5.0 - 8.0 mm, more preferably 6.5 - 7.0 mm. The diameter of the third steel wires is at least 4 mm, preferably in the range of 5.0 - 8.0 mm, more preferably 6.5 - 7.0 mm. The third steel wires are normally identical to the second steel wires.

[0021] According to one embodiment the first and the second horizontal edge of the edge barrier element have a length in the range of 0.5 - 2.6 m, preferably 2.2 - 2.6 m, and/or the first and the second vertical edge of the edge barrier element have a length in the range of 1.0 - 1.3 m, preferably 1.2 - 1.3 m. The edge barrier element

has the shape of standing rectangle, horizontal rectangle or square. Normally the weight of the edge carrier element is 6 - 20 kg.

[0022] Some embodiments of the invention is described in more detail with reference to appended schematic and non-limiting drawings, in which

Figure 1A shows a front view of a first side of an edge barrier element according to a first embodiment of the invention,

Figure 1B shows a side view of the edge barrier element according to the first embodiment of the invention,

Figure 2A shows a front view of a first side of an edge barrier element according to a second embodiment of the invention, and

Figure 2B shows a side view of the edge barrier element according to the second embodiment of the invention.

[0023] Figure 1A shows a front view of a first side of an edge barrier element according to a first embodiment of the invention. The edge barrier element 1 is rectangular and it has a first and a second horizontal edge 2, 2', which are parallel to each other. The distance between the first and second horizontal edge 2, 2' defines the height of the edge barrier element 1. Further, the edge barrier element has a first and a second vertical edge 3, 3', which are parallel with each other and perpendicular to the first and second horizontal edge 2, 2'. The distance between the first and second vertical edge 3, 3' defines the length of the edge barrier element 1. The horizontal and vertical edges are naturally attached to each other by suitable means, e.g. by welding.

[0024] The edge barrier element 1 comprises further a plurality of vertical first steel wires 4, 4', 4'', which are arranged to connect the first and the second horizontal edge 2, 2'. The vertical first steel wires 4, 4', 4'' are parallel with the first and the second vertical edge 3, 3' and located between them. The edge barrier element 1 comprises also a plurality of second steel wires 5, 5', 5'', 5''', which are arranged perpendicularly on to the first steel wires 4, 4', 4'', and attached to them by welding. The horizontal second steel wires 5, 5', 5'', 5''' extend from the first vertical edge 3 to the second vertical edge 3' and are attached to them by welding. The horizontal second steel wires 5, 5', 5'', 5''' are parallel with the first and the second horizontal edge 2, 2' and located between them.

[0025] It can be seen from Figure 1A that the distances between adjacent vertical steel wires 4, 4' and adjacent horizontal steel wires 5, 5' are constant, except on the edge areas of the edge barrier element 1. The distance between the horizontal second steel wire 5 at the first vertical edge 2 of the barrier element 1 and the adjacent horizontal second steel wire 5' towards the centre of the

barrier element 1 is shorter than the distance between other adjacent horizontal second steel wires 5', 5''. This makes the first horizontal edge 2 of the edge barrier element 1 more stable. Correspondingly, the distance between the vertical first steel wire 4 at the first vertical edge 3 of the barrier element 1 and the adjacent vertical first steel wire 4' towards the centre of the barrier element 1 is shorter than the distance between other adjacent vertical first steel wires 4', 4''. This makes the first vertical edge 3 of the edge barrier element 1 more stable. The second vertical edge 3' corresponds to the first vertical edge 3.

[0026] A toeboard 7 is permanently attached, e.g. by welding, to the second vertical steel wires of the edge barrier element 1.

[0027] Figure 1B shows a side view of the edge barrier element 1 according to the first embodiment of the invention. From Figure 1B it is seen that on the first and second vertical edge 2, 2' of the barrier element 1 is arranged third steel wires 6, 6', 6'', 6''' are arranged at a second side of the first steel wires. The third steel wires 6, 6', 6'', 6''' are essentially opposite and parallel to corresponding second steel wires 5, 5', 5'', 5''', which are on the first side of the first steel wires.

[0028] Figure 2A shows a front view of a first side of an edge barrier element according to a second embodiment of the invention. Same reference numbers as in Figures 1A and 1B are used for corresponding parts and elements. From Figure 2A it can be seen that the distance between the adjacent first steel wires 4'', 4''' decreases gradually from the first and second vertical edge 3, 3' towards the centre of the barrier element 1. The distance between the adjacent first steel wires 4'', 4''' near the edge 3 of the barrier element 1 is longer than the distance between the adjacent first steel wires 8, 8' in the centre part of the barrier element 1. The toeboard in Figure 2A is made of two toeboard parts 7, 7'.

[0029] Figure 2B shows a side view of the edge barrier element according to the second embodiment of the invention. Same reference numbers as in Figures 1A and 1B are used for corresponding parts and elements.

[0030] Even if the invention was described with reference to what at present seems to be the most practical and preferred embodiments, it is appreciated that the invention shall not be limited to the embodiments described above, but the invention is intended to cover also different modifications and equivalent technical solutions within the scope of the enclosed claims.

Claims

1. Edge barrier element for use in building construction or the like, the edge barrier element (1) being rectangular and having a first and a second horizontal edge (2, 2'), which are parallel to each other, and a first and a second vertical edge (3, 3'), which are parallel with each other and perpendicular to the first

and second horizontal edge (2, 2'),
the barrier element (1) further comprising

- a plurality of first steel wires (4, 4', 4''), which are arranged to connect the first and the second horizontal edge (2, 2'), and which are parallel with the first and the second vertical edge (3, 3') and between them,
- a plurality of second steel wires (5, 5', 5'', 5'''), which are arranged on a first side of the first steel wires (4, 4', 4''), perpendicular to them and attached to them by welding,

characterised in that

at least on the first and second horizontal edge (2, 2') third steel wires (6, 6') are arranged at a second side of the first steel wires (4, 4', 4''), so that the third steel wires (6, 6') are essentially opposite and parallel to corresponding second steel wires (5, 5', 5'', 5''') on the first side of the first steel wires (4, 4', 4'')..

2. Edge barrier element according to claim 1, **characterised in that** the distance between the first steel wires (4, 4', 4'') decreases from the first and second vertical edge (3, 3') towards the centre of the barrier element (1). 25
3. Edge barrier element according to claim 2, **characterised in that** the distance between the first steel wires (4, 4', 4'') decreases stepwise. 30
4. Edge barrier element according to claim 2, **characterised in that** towards the centre of the barrier element (1) each distance between two adjacent first steel wires (4, 4', 4'') is smaller than the preceding distance towards the nearest vertical edge. 35
5. Edge barrier element according to any of claims 1 - 4, **characterised in that** the barrier element (1) is essentially planar. 40
6. Edge barrier element according to any of claims 1 - 5, **characterised in that** the number of third steel wires (6, 6') on the second side of the first steel wires (4, 4', 4'') is the same as the number of second steel wires (5, 5', 5'', 5''') on the first side of the first steel wires (4, 4', 4''), and that the third steel wires (6, 6') and the second steel wires (5, 5', 5'', 5''') are essentially opposite and parallel to each other. 50
7. Edge barrier element according to any of claims 1 - 6, **characterised in that** third steel wires (6, 6') are arranged on the second side of the first steel wires (4, 4', 4'') and essentially opposite and parallel to corresponding second steel wires (5, 5', 5'', 5''') only on an edge area, which extends 0.0 - 0.40 m from the first and the second edge (2, 2') towards the centre of the barrier element (1). 55

8. Edge barrier element according to claim 1, **characterised in that** the distance between two adjacent first steel wires (4, 4', 4'') is in the range of 0.015 - 0.25 m, preferably 0.017 - 0.109 m, and/or the distance between two adjacent second steel wires (5, 5', 5'', 5''') is in the range of 0.02 - 0.25 m, preferably 0.075 - 0.195 m, calculated from the centre of the wire to the centre of the nearest adjacent wire.
9. Edge barrier element according to any of preceding claims 1 - 8, **characterised in that** the distance between the adjacent second steel wires (5, 5', 5'', 5''') decreases from the first and second horizontal edge (2, 2') towards the centre of the barrier element (1).
10. Edge barrier element according to any of preceding claims 1 - 9, **characterised in that** the barrier element comprises at the second horizontal edge (2') a toeboard, which comprises a first toeboard part (7') arranged on the first side of the first steel wires (4, 4', 4''), and a second toeboard part (7''), arranged on the second side of the first steel wires (4, 4', 4'').
11. Edge barrier element according to any of preceding claims 1 - 10, **characterised in that** the diameter of the first steel wires (4, 4', 4'') is at least 3 mm, preferably 4.0 - 6.0 mm.
12. Edge barrier element according to any of preceding claims 1 - 11, **characterised in that** the diameter of the second steel wires (5, 5', 5'', 5''') is at least 4 mm, preferably 5.0 - 8.0 mm.
13. Edge barrier element according to any of preceding claims 1 - 12, **characterised in that** the first and the second horizontal edge have a length in the range of 0.5 - 2.6 m, preferably 2.2 - 2.6 m, and/or the first and the second vertical edge have a length in the range of 1.0 - 1.3 m, preferably 1.2 - 1.3 m.

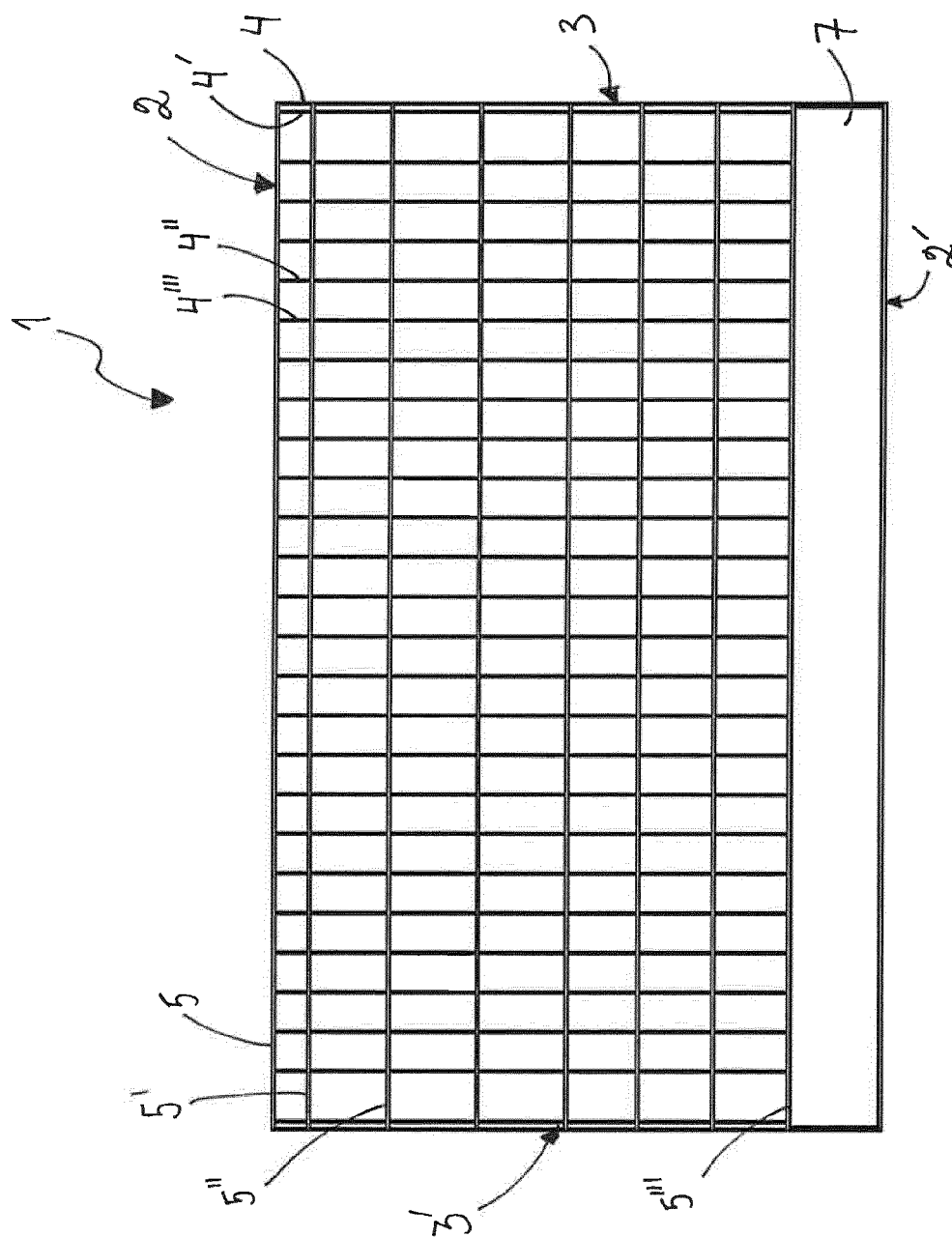


FIG. 1A

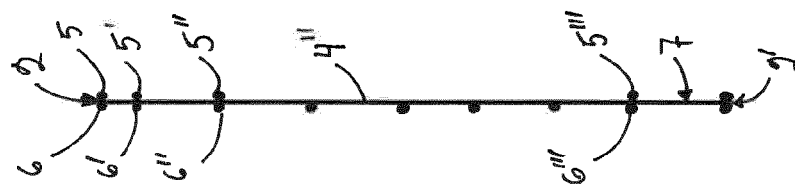


FIG. 1B

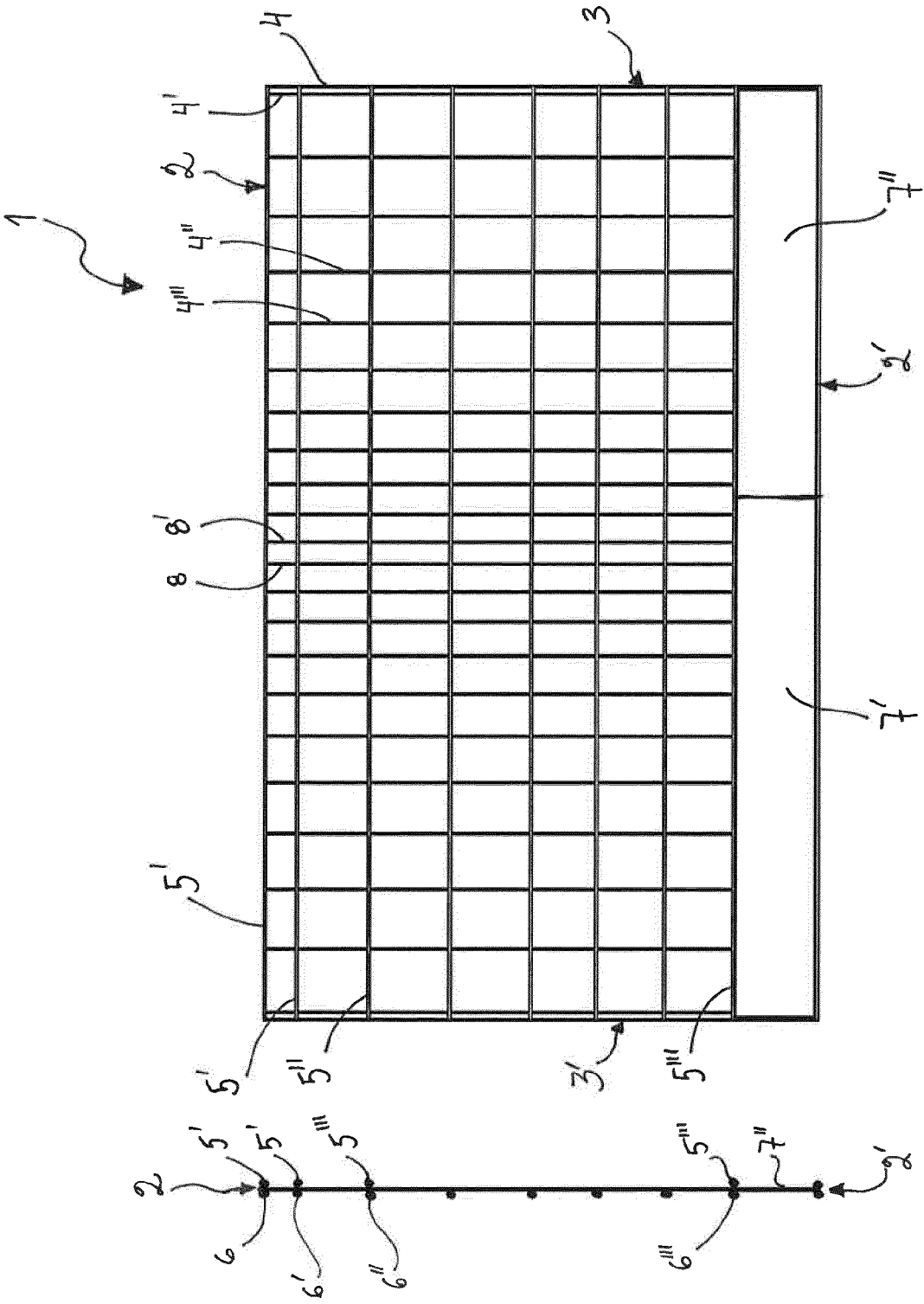


FIG. 2A

FIG. 2B



EUROPEAN SEARCH REPORT

Application Number
EP 15 17 1474

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Y	* column 2, paragraph 13 - column 4, paragraph 24; figures 1-3 *	2-4,9	
Y	JP S59 132857 U (JAPAN LIGHT METAL) 5 September 1984 (1984-09-05) * figure 15 *	2-4,9	
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (IPC)
			E04G E04H E04F
Place of search		Date of completion of the search	Examiner
The Hague		30 September 2015	Melhem, Charbel
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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