(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 2 947 218 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
25.11.2015 Bulletin 2015/48

(21) Application number: **15168551.8**

(22) Date of filing: **21.05.2015**

(51) Int Cl.:
E04C 5/06 *(2006.01)* ***E04B 5/32*** *(2006.01)*
E04C 5/16 *(2006.01)* ***E02D 27/08*** *(2006.01)*

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
MA

(30) Priority: **21.05.2014 NL 2012852**

(71) Applicant: **G. Taekema Holding B.V.**
9261 XN Eastermar (NL)

(72) Inventor: **Taekema, Gabe**
9261 XN Eastermar (NL)

(74) Representative: **Altenburg, Bernardus Stephanus Franciscus**
Altenburg Patent
Ravelijnstraat 125
4102 AJ Culemborg (NL)

(54) **A METHOD OF MANUFACTURING A REINFORCED CONCRETE FLOOR ON A BASE**

(57) A method of manufacturing a reinforced concrete floor on a base, the method comprising the steps of
- providing a 3D reinforcement structure on a top face of the base, the 3D reinforcement structure comprising
a) a first layer of first reinforcement members supported by first profiles,
b) a second layer of second reinforcement members supported by second profiles, and
c) a plurality of pillars in a upright position for supporting the second profiles, the distance of the second layer to the top face of the base being greater than the distance of the first layer to said top face;

- applying liquid concrete, and
- leaving the concrete to set

wherein in the step of providing the 3D reinforcement structure a first profile and a pillar of the plurality of pillars are provided in a received relationship, the upright position of the pillar being stabilised by the first profile supported by the base.

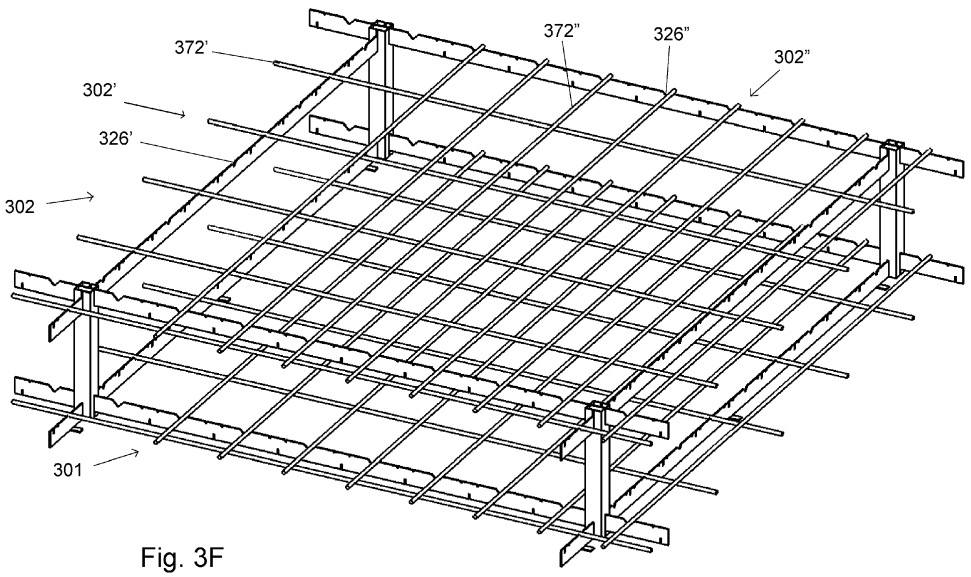


Fig. 3F

EP 2 947 218 A1

Description

[0001] The present invention relates to a method of manufacturing a reinforced concrete floor on a base, the method comprising the steps of

- providing a 3D reinforcement structure on a top face of the base, the 3D reinforcement structure comprising

  a) a first layer of first reinforcement members supported by first profiles,
  b) a second layer of second reinforcement members supported by second profiles, and
  c) a plurality of pillars in a upright position for supporting the second profiles, the distance of the second layer to the top face of the base being greater than the distance of the first layer to said top face;

- applying liquid concrete on top of the top face of the base and the 3D reinforcement structure, and
- leaving the concrete to set.

[0002] JPH0913399 discloses a method according to the preamble, wherein the first profiles and the second profiles are supported by a plurality of pillars placed in an upright position, said pillars being anchored to the top face of the base using screws.

[0003] Providing the 3D reinforcement structure is time consuming.

[0004] The object of the present invention is to provide a method according to the preamble that allows for providing the 3D reinforcement structure faster.

[0005] To this end, a method according to the preamble is characterized in that in the step of providing the 3D reinforcement structure a first profile and a pillar of the plurality of pillars are provided in a received relationship, the upright position of the pillar being stabilised by the first profile supported by the base.

[0006] Thus a 3D reinforcement structure comprising a first layer and a second layer of reinforcement members can be provided faster. The pillar is maintained in the upright position by the first profile. Thus, there is no need to screw the pillar to the base to get a pillar stable enough when a second profile is provided to said pillar in a following step.

[0007] To support the pillar in the upright position, the first profile and the pillar are provided in a received relationship. The first profile comprises an abutment area that cooperates with a contact area of the pillar for exerting a counter-force on said contact area by said abutment area to maintain said pillar in the upright position, the contact area being at a distance from the bottom end of said pillar. The cooperation between the abutment area and the contact area may also allow for helping to maintain the first profile supported on the base in an operational orientation to allow the reinforcement members of the first layer to be supported.

[0008] In the present invention, the abutment area can be provided for example by a ring that embraces the perimeter of the pillar, the area of the perimeter embraced then providing the contact area. In a different embodiment, the abutment area is provided by a flange that gets inserted into a slot of the pillar when said pillar is provided, the walls defining said slot then providing the contact area.

[0009] It is preferred that the abutment area is in contact with the contact area when the pillar is in the upright position to reduce movement of the pillar when providing the second profile to said pillar.

[0010] In the present application the terms first and second in the different elements of the 3D reinforcement structure only refer to the first layer and to the second layer respectively. Thus, the term first in the first profiles means profiles for supporting the first layer. Also, the term second in the second profiles means profiles for supporting the second layer. Thus, the first profile and the second profile may have the same shape. This is also applicable to the term first and second in the first reinforcement members and the second reinforcement members. In particular if the reinforcement elements are reinforcement bars, profiles will comprise cut-outs for supporting the reinforcement elements.

[0011] In general, at most 80% of the weight of the first reinforcement members is supported by first profiles supported via the pillars. Preferably, this percentage is at most 60% such as at most 40%. In a preferred embodiment of the present invention, all the weight of the first reinforcement members bypasses the pillars and is supported by the first profiles on the base only.

[0012] According to a favourable embodiment, the first profile comprises a foot, and when providing the first profile and the pillar, said first profile is placed with its foot on the top face of the base.

[0013] Thus, the pillar can be easily provided in the upright position. It is preferred that the first profile is a L-shaped profile, wherein one arm of the L-shaped profile comprises cut-outs for supporting first reinforcement elements and the other arm defines the foot of said first profile.

[0014] According to a favourable embodiment, the first profile is supported on the top face of the base and then the pillar is provided to said first profile.

[0015] Thus, the pillar can be easily provided in the upright position. Furthermore, cut-outs or slots in the first profiles may serve as a reference to determine where to place the pillars.

[0016] According to a favourable embodiment, the pillar comprises a bottom end and said bottom end rests on the top face of the base after being provided to the first profile.

[0017] Thus the pillar may help to maintain the first profile in the operational orientation once the first profile and the pillar are provided in the receiving relationship. This obviates the need for feet and allows for the use of

cheaper first profiles.

[0018] According to a favourable embodiment, the first profiles comprise

- primary first profiles; and
- secondary first profiles oriented transverse to the primary first profiles;

wherein in the step of providing a first profile with a pillar, a pillar is provided to at least one of i) the primary first profiles and ii) the secondary first profiles.

[0019] Thus a more stable 3D reinforcement structure is provided. It is preferred that the pillar is provided at a cross-section of a primary first profile and secondary first profile, further improving the stability of said pillar.

[0020] According to a favourable embodiment, in the step of providing the 3D reinforcement structure the primary first profile supports the pillar and said pillar supports the secondary first profile.

[0021] Thus, the stability of the pillars in the upright position can be improved by the weight of the reinforcement members.

[0022] According to a favourable embodiment, at least one of the primary first profile and the secondary first profile comprises an upward section and the pillar comprises a downward facing slot extending from an end of said pillar, and the pillar is fitted by allowing the downward facing slot to receive the upward section of said first profile.

[0023] Thus, the pillar can be fitted very easily. The abutment area is provided by the upward section, for example a flange, and the contact area of the pillar is provided by the downward facing slot.

[0024] According to a favourable embodiment, the downward facing slot is a first slot and the upward section of the first profile comprises a upward facing second slot and the pillar is fitted by inserting the first slot into the second slot.

[0025] Thus, the pillar can be placed in very stable manner, making the pillar very stable before providing another (secondary) first profile or a second profile to said pillar. It also makes the 3D reinforcement structure more stable when walking on it and/or during the pouring of concrete. The second slots allow for easy and quick distribution of pillars over the length of the profile.

[0026] According to a favourable embodiment, both a primary first profile and a secondary first profile of the first layer are interlocked using slots before a pillar is placed in a receiving relationship with at least one of said first profiles.

[0027] Thus, a very stable first layer of first profiles, optionally with reinforcement members, can be provided fast since the profiles of the first layer are supported in the desired orientation on the top face of the base. Feet are not necessary.

[0028] According to a favourable embodiment, at least one of the first profiles and the pillars is made of plastic.

[0029] Thus, a 3D reinforcement structure that lasts long is provided, since the risk of corrosion that may compromise the 3D reinforcement structure once the reinforced concrete floor has been manufactured is reduced. It is preferred that both the first profiles and the pillars are made of plastic.

[0030] According to a favourable embodiment, the base is a plastic sheet.

[0031] This helps to protect the concrete floor from water, in particular as groundwater. The thickness of the base will in general be at least 0.1 mm, preferably at least 0.3 mm, and more preferably at least 1 mm.

[0032] According to a favourable embodiment, the plastic sheet comprises a grid of protrusions protruding upwards and the first profile is positioned on the top surface of the base.

[0033] The protrusions allow for an improved connection of the plastic sheet to the concrete, improving the barrier properties to water and thus the longevity of the reinforced concrete floor. In general, the grid will comprise rows and columns of protrusions at right angles to each other. Plastic sheet comprising a grid of projections for this purpose is known in the art. It is used to manufacture concrete basins for treatment of sewer waste, protecting the concrete from sulphur-containing compounds and acid. The plastic protrusions are embedded in the liquid concrete and once embedded hold the plastic sheet in place. The height of the protrusions will generally be more than 0.5 cm, such as 1 to 20 cm, and preferably 1,5 to 6 cm.

[0034] According to a favourable embodiment, the first profile placed on top of the base is aligned using the grid of protrusions as a reference.

[0035] This makes it quicker to lay out the first profiles and the pillars, reducing the (labour) cost. Alignment may be done by contacting a first profile against one side of a row of protrusions.

[0036] According to a favourable embodiment, the first profile supported on the top surface of the plastic sheet is aligned by contacting said first profile with two sides of at least one row of protrusions.

[0037] Thus, the risk of shifting of the 3D reinforcement structure is reduced, making the 3D reinforcement structure safer to walk on, e.g. during providing of liquid concrete. The protrusions may be of a single row of protrusions, in which case the profile may comprise an inverted U-shaped cross-section receiving said single row of protrusions. Alternatively, the first profile is snugly fitted or clamped between two rows of protrusions, usually two adjacent rows of protrusions.

[0038] According to a favourable embodiment, at least one of the i) first reinforcement members and ii) the second reinforcement members, of the 3D reinforcement structure are reinforcement bars.

[0039] The reinforcement bars are easier to handle and cheaper to transport than reinforcement nets. More importantly, they can be longer (e.g. 12 m instead of 6 m for reinforcement nets), as a result of which the resulting reinforced concrete floor can be stronger and/or thinner

for a given strength. Combining profiles and reinforcement bars allows for easy and quick preparation of a strong 3D reinforcement structure.

[0040] The present invention will now be illustrated with reference to the drawing where

Fig. 1 shows a top view of a sheet of plastic provided with protrusions, according to the state of the art, for use with the method according to the invention;
Fig. 2 shows a cross-sectional view through a protrusion of the plastic sheet of Fig. 1;
Fig. 3a - 3f demonstrate an embodiment of the method according to the present invention;
Fig. 4 shows different embodiments of first profiles;
Fig. 5 shows different embodiments of pillars; and
Fig. 6 shows a different embodiment of a 3D reinforcement structure.

[0041] Fig. 1 shows a top view of a base 100 in the form of a sheet 100 of plastic, such as a polyethylene sheet having a material thickness of 2 mm, provided with protrusions 101 in a grid pattern comprising rows and columns at right angles to each other. Such a sheet 100 is available from Steuler Industriewerke GmbH, Remseck/Aldingen, Germany or AGRU, Kunststofftechnik GmbH, Bad Hall, Austria.

[0042] In the present embodiment, the protrusions 101 are knobs, but they may come in many different forms and the sheets may be joined.

[0043] The protrusions are evenly spaced apart in a rectangular grid, such as at a distance of 5 cm from each other.

[0044] In Fig. 1, an edge of sheet 100 is heat sealed in a known manner to an edge of a second sheet 100', extending the grid of protrusions 101.

[0045] Fig. 2 shows the plastic sheet 100 of Fig. 1 in cross-sectional view. The protrusions 101 have a mushroom-like shape, with a head 202 that is wider than a stem 203. Once liquid concrete poured onto the plastic sheet 100 is set, this will prevent said plastic sheet 100 from delaminating from the set concrete.

[0046] Now, an embodiment of the method according to the invention will be illustrated, said method involving providing the base 100 with a 3D reinforcement structure 300 (see Fig. 3f), pouring liquid concrete over the base 100 to embed the 3D reinforcement structure 300, and allowing the liquid concrete to set. Providing the 3D reinforcement structure 300 is shown with reference to Figs. 3a to 3f.

[0047] Fig. 3a shows first profiles 310 placed on a top face of the base 100. In the present embodiment of the invention, the base 100 is the plastic sheet 100 (protrusions 101 not shown in Fig. 3). In the embodiment shown, primary first profiles 310' are placed parallel to each other using rows of protrusions 101 of said plastic sheet 100 as a reference for aligning them.

[0048] The primary first profiles 310' comprise a strip of metal (steel) defining an upward facing section 311' transverse to feet 312. The feet 312 allow for maintaining said upward facing section 311' in an upright position, which facilitates construction of the 3D reinforcement structure 300.

[0049] In this embodiment, the primary first profiles 310' are provided with transverse secondary first profiles 310" (Fig. 3b).

[0050] The secondary first profiles 310" comprises a strip of metal (steel) defining an upward facing section 311", said upward facing section 311" comprising downward facing slots 314".

[0051] The secondary first profiles 310" are fitted perpendicularly onto the first primary first profiles 310' by sliding the downward facing slots 314" onto the bottom side of upward facing slots 315' present in the upward facing section 311' of said primary first profiles 310', preferably such that the secondary first profiles 310" touch the base 100. The fitting can be done easily and relatively fast since the upward facing section 311' of the primary first profiles 310' is maintained in the upright position by the feet 312.

[0052] The secondary first profiles 310" determine the distance between two primary first profiles 310' parallel to each other. Thus, a secondary first profile 310" can be used also as reference when placing two primary first profiles 310' parallel to each other, as shown in Fig. 3a.

[0053] In general, the primary first profiles 310' and/or the secondary first profiles 310" comprise more upward facing slots 315' and downward facing slots 314" than necessary, which allows for fitting said first profiles 310 in different arrangements.

[0054] Next, pillars 330 are provided at the cross-sections of the primary first profiles 310' and the secondary first profiles 310". Instead, they could have been provided on one of the primary first profiles 310' and the secondary first profiles 310", or a combination thereof.

[0055] In the present embodiment, a pillar 330 has a square cross-section defining four lateral faces, a bottom end 332 for supporting said pillar in a upright position and a upper end 333. The pillar 330 comprises a downward facing slot 334' at each of two opposite faces of the pillar 330 and a downward facing slot 334" at each of the other two opposite faces of said pillar 330. The downward facing slots 334', 334" extend in the longitudinal direct of the pillar 330 and open up at the bottom end 332.

[0056] The pillars 330 are fitted at the intersection of the primary first profiles 310' and the secondary first profiles 310" by sliding the downward facing slots 334' and 334" over the upward facing sections 311' and 311" respectively. Each pillar 330 is then in a receiving relationship with both the primary first profiles 310' and the secondary first profiles 310". In the receiving relationship of the present embodiment, the downward facing slots at the bottom end 332 of the pillar 330 are so long that the pillars 330 are supported on the base 100. The primary first profiles 310' help to maintain said pillars 330 in the upright position since the upward facing section 311' exerts a counter-force to an area of said pillar 330

defined by the downward facing slots 334' when said pillar 330 is tilted away from the vertical. Tilting away in a transverse direction is countered by the secondary first profile 310" directly or indirectly via the primary first profile 310' with which the secondary first profile 310" is engaged.

[0057] Next, a first layer 301 of first reinforcement members 371 is provided, as shown in Fig 3d. The first layer 301 comprises a primary first layer 301' of primary first reinforcement members 371' and a secondary first layer 301" of secondary first reinforcement members 371". Both sub-layers 301', 301" are arranged parallel to the top face of the base 100, the primary first reinforcement members 371' being transverse to the secondary first reinforcement members 371".

[0058] The primary first profiles 310' support the primary first reinforcement members 371' thanks to cut-outs 316'. Similarly, the secondary first profiles 310" support the secondary first reinforcement members 371" by cut-outs 316".

[0059] The secondary first reinforcement members 371" are at a distance from the top face of the base 100 different from (here, greater than) the distance of the primary first reinforcement members 371' with respect to said top face of the base 100. In the present embodiment this is achieved since the cut-outs 316' present in the upward facing section 311' are deeper that the cut-outs 316" present in the upward facing section 311".

[0060] The cut-outs 316' and 316" will in general be evenly spaced. The spacing thereof will be independent of the spacing of the protrusions 101 of the base 100. There may be more first cut-outs 316' or first cut-outs 316" than are actually used. This allows the amount of reinforcement to be locally varied within a floor to be manufactured depending on the anticipated local loads that said floor will be subjected to in life. This saves money.

[0061] Next, second profiles 320 are provided to the pillars 330 (Fig. 3e). The second profiles 320 are primary second profiles 320' and secondary second profiles 320".

[0062] Each of the primary second profiles 320' comprises an upward facing section 321' and upward facing slots 325'. Each of the secondary second profiles 320" comprises an upward facing section 321" and downward facing slots 324".

[0063] The primary second profiles 320' and the secondary second profiles 320" are supported by the pillars 330. To this end, said pillars 330 comprise an upward facing slot 335' at each of two opposite faces of the pillar 330, and an upward facing slot 335" at each of the other two opposite faces. Said upward facing slots 335', 335" extend in the longitudinal direction of the pillar 330 and open up at its upper end 333.

[0064] The primary second profiles 320' are supported by sliding the bottom edge of its upward facing section 321' into the upward facing slots 335'. Similarly, the secondary second profiles 320" are fitted to said primary second profile 320' by sliding the bottom edge of the upward facing section 321" into the upward facing slots 335" such that the downward facing slot 324" of said secondary second profile 320" slides into the upward facing slot 325' of the primary second profiles 320'.

[0065] Finally, a second layer 302 of second reinforcement members 372 is then provided to yield the 3D reinforcement structure 300, as shown in Fig. 3f of the present embodiment. The second layer 302 comprises a primary second layer 302' of primary second reinforcement members 372' and a secondary second layer 302" of secondary second reinforcement members 372". Both sub-layers 302', 302" are arranged parallel to the top face of the base 100, the second reinforcement members 372' being arranged transversely with respect to the second reinforcement members 372".

[0066] The upward facing section 321' comprises cut-outs 326' and the upward facing section 321" comprises cut-outs 326". The cut-outs 326' and 326" support the primary second reinforcement members 372' and the secondary second reinforcement members 372" respectively.

[0067] The secondary second reinforcement members 372" are arranged at a distance from the top face of the base 100 different from (here, greater than) the distance of the second reinforcement members 372'. In the present embodiment of the invention this is achieved since the cut-outs 326' are deeper than the cut-outs 326", the primary second profiles 320' and the secondary second profiles 320" at the same distance to said top face of the base 100.

[0068] The first reinforcement members 371 and 371' and the second reinforcement members 372' and 372" are in general reinforcement bars, usually made of steel, as are common in the art.

[0069] Profiles may contain through-holes so as to allow concrete to reach from one side of the profile to the other and improve strength of the final floor.

[0070] The present invention may be varied within the scope of the appended claims in several ways. For example, Fig. 4 depicts different embodiments for the profile that can be used when providing the 3D reinforcement structure 300.

[0071] Fig 4a depicts the primary first profiles 310' used in the 3-D reinforcement structure discussed previously in Fig. 3a. As mentioned before, the upward facing section 311' is maintained in the upright position by the feet 312'.

[0072] However, the first profiles 310' may also have a L-shaped form, as shown in Fig. 4b. A first arm defines the upward facing section 311' and a second arm (flange) defines the foot 312", which maintains said said upward facing section 311' in the upright position. This second arm (flange) improves the rigidity of the profile.

[0073] Also, in a different embodiment, the upward facing section 311' of the primary first profile 310' may not comprise feet, as depicted in Fig. 4c. Then it is preferred that the upward facing section 311' of said primary first profile 310' and the upward facing section 311" is supported and maintained in the upright position by cooper-

ation with a secondary first profile 310". The cooperation arises once the downward facing slots 314" of said secondary first profile 310" is fitted into the bottom section of the upward facing slots 315' of the primary first profile 310'.

[0074] Profiles of the first profiles 310 and second profiles 320 may be identical, which saves money. The same kind of profile comprises thus upward facing slots and downward facing slots, as shown in Fig 4D, and feet can be fitted to the bottom side of the upward facing section when needed. The cut-outs would have the same depth and the distance of the different primary layers and secondary layers of reinforcement members is stablished by the slots comprised at the pillars 330, said bottom side of said slots arranged at different heights from the bottom end 332. Profiles comprising two different type of cut-outs, said cut-outs having different depths is also possible.

[0075] Also, the pillars may be in different embodiments, as shown in Fig. 5. For example, Fig 5a depicts the pillar 330 used in the 3D reinforcement structure 300 discussed in Fig. 3.

[0076] In a different embodiment, the pillar 330 comprises a longitudinal slot 336" and 337" extending in the longitudinal direction of the pillar 330, as shown in Fig. 5b. The longitudinal slot 336" is used to support the secondary first profile 310" (discussed below with reference to Fig. 6) by said pillar, which is achieved by sliding a downward facing slot 314" of said secondary first profile 310" into the bottom part of said longitudinal slot 336". On the other hand, the longitudinal slot 337" is used to support the secondary second profile 320" (not shown) by sliding the downward facing slot 324" of said secondary second profile 320" into the bottom part of the longitudinal slot 337".

[0077] Furthermore, the top side of the downward facing slots 334' and 334" of the pillar 330 may be arranged at different heights, as shown in Fig. 5c. This allows for fitting said pillar to first profiles 310 wherein the top side of the upward facing section of said profiles are at different heights from the top face of the base 100 in order provide the primary first layer 301' and the secondary first layer 301" of reinforcement members at different heights. The same is applied to the bottom side of the upward facing slots 335' and 335".

[0078] The pillar 330 may have a cross-section other than square, such as rectangular, circular, etc. Furthermore, first profiles 310 may be supported on the protrusions 101 of the plastic sheet 100, the top face of the head 202 acting thus as the top face of the base 100. This reduces the risk of corrosion.

[0079] Fig. 6 illustrates a different embodiment of the 3D reinforcement structure 300. In this embodiment, the pillar 330 depicted in Fig. 5b is used. Said pillar 330 can be provided on top of the primary first profiles 310' thanks to the downward facing slots 334' and then, the secondary first profiles 310" are supported by the said pillars 330 at the longitudinal slots 336". Thus, the stability of the pillars 330 in the upright position is improved, since this pillar is in a received relationship in the upright position with the primary first profile 310' and the secondary first profile 310". Here, the weight of first reinforcement members supported by the secondary first profile 310" is passed to the base 100 via the pillar 330, which is not the case for the weight of the first reinforcement members supported by the primary first profile 310'.

[0080] The invention may be varied within the scope of the claims. For example, the secondary profiles may have a flange transverse to the upward facing sections, comprising a cut-out at the location of the pillar. This helps to improve the stability of the 3D reinforcement structure.

Claims

1. A method of manufacturing a reinforced concrete floor on a base (100), the method comprising the steps of

    - providing a 3D reinforcement structure (300) on a top face of the base (100), the 3D reinforcement structure (300) comprising

        a) a first layer (301) of first reinforcement members (371) supported by first profiles (310),
        b) a second layer (302) of second reinforcement members (372) supported by second profiles (320), and
        c) a plurality of pillars (330) in a upright position for supporting the second profiles (320), the distance of the second layer (302) to the top face of the base (100) being greater than the distance of the first layer (301) to said top face;

    - applying liquid concrete on top of the top face of the base (100) and the 3D reinforcement structure (300), and
    - leaving the concrete to set

    characterized in that in the step of providing the 3D reinforcement structure (300) a first profile (310) and a pillar (330) of the plurality of pillars (330) are provided in a received relationship, the upright position of the pillar (330) being stabilised by the first profile (310) supported by the base (100).

2. The method according to claim 1, wherein the first profile (310) comprises a foot (312), and when providing the first profile (310) and the pillar (330), said first profile (310) is placed with its foot (312) on the top face of the base (100).

3. The method according to claim 2, wherein the first profile (310) is supported on the top face of the base

(100) and then the pillar (330) is provided to said first profile (310).

4. The method according to any of the preceding claims, wherein the pillar (330) comprises a bottom end (332) and said bottom end (332) rests on the top face of the base (100) after being provided to the first profile (310).

5. The method according to any of the preceding claims, wherein the first profiles (310) comprise

- primary first profiles (310); and
- secondary first profiles (310) oriented transverse to the primary first profiles (310);

wherein in the step of providing a first profile (310) with a pillar (330), a pillar (330) is provided to at least one of i) the primary first profiles (310) and ii) the secondary first profiles (310).

6. The method according to claim 5, wherein in the step of providing the 3D reinforcement structure (300) the primary first profile (310) supports the pillar (330) and said pillar (330) supports the secondary first profile (310).

7. The method according to any of the claims 5 or 6, wherein at least one of the primary first profile (310) and the secondary first profile (310) comprises an upward section and the pillar (330) comprises a downward facing slot extending from an end of said pillar (330), and the pillar (330) is fitted by allowing the downward facing slot to receive the upward section of said first profile (310).

8. The method according to claim 7, wherein the downward facing slot is a first slot and the upward section of the first profile (310) comprises a upward facing second slot and the pillar (330) is fitted by inserting the first slot into the second slot.

9. The method according to any of the claims 5 to 8, wherein both a primary first profile (310) and a secondary first profile (310) of the first layer (301) are interlocked using slots before a pillar (330) is placed in a receiving relationship with at least one of said first profiles (310).

10. The method according to any of the preceding claims, wherein at least one of the first profiles (310) and the pillars (330) is made of plastic.

11. The method according to any of the preceding claims, wherein the base (100) is a plastic sheet (100).

12. The method according to claim 11, wherein the plastic sheet (100) comprises a grid of protrusions (101) protruding upwards and the first profile (310) is positioned on the top surface of the base (100).

13. The method according to claim 12, wherein the first profile (310) placed on top of the base (100) is aligned using the grid of protrusions (101) as a reference.

14. The method according to claim 13, wherein the first profile (310) supported on the top surface of the plastic sheet (100) is aligned by contacting said first profile (310) with two sides of at least one row of protrusions (101).

15. The method according to any of the preceding claims, wherein at least one of the i) first reinforcement members (371) and ii) the second reinforcement members (372), of the 3D reinforcement structure (300) are reinforcement bars.

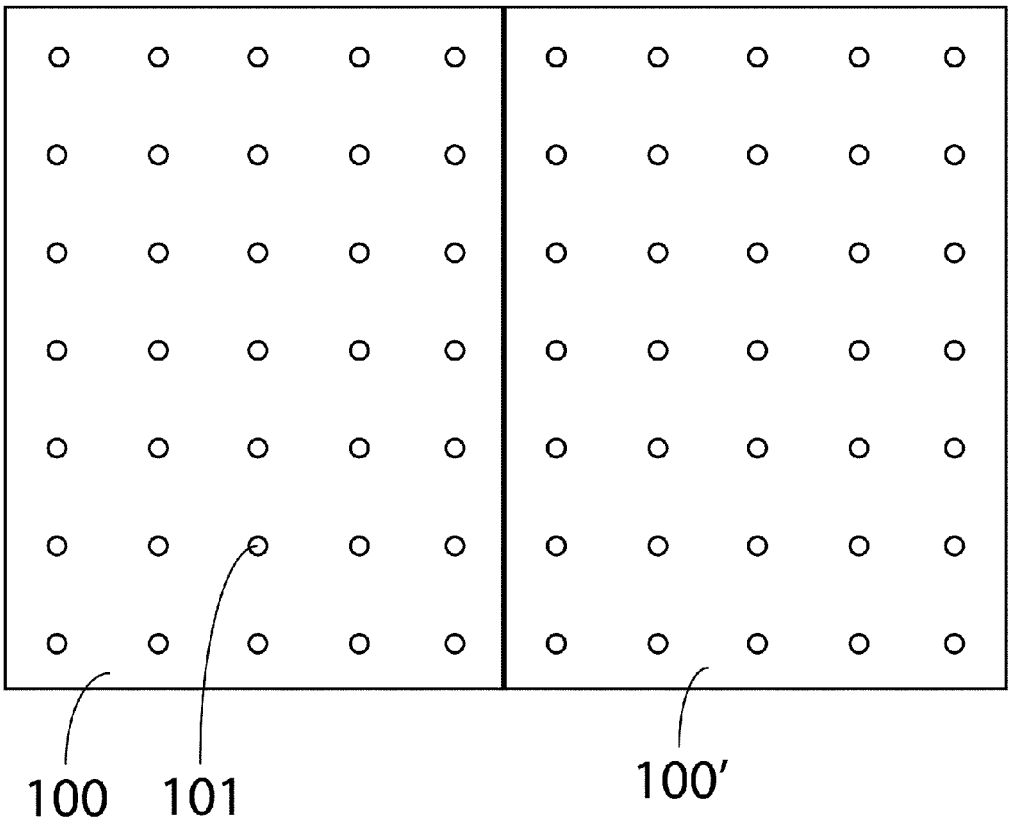


Fig. 1

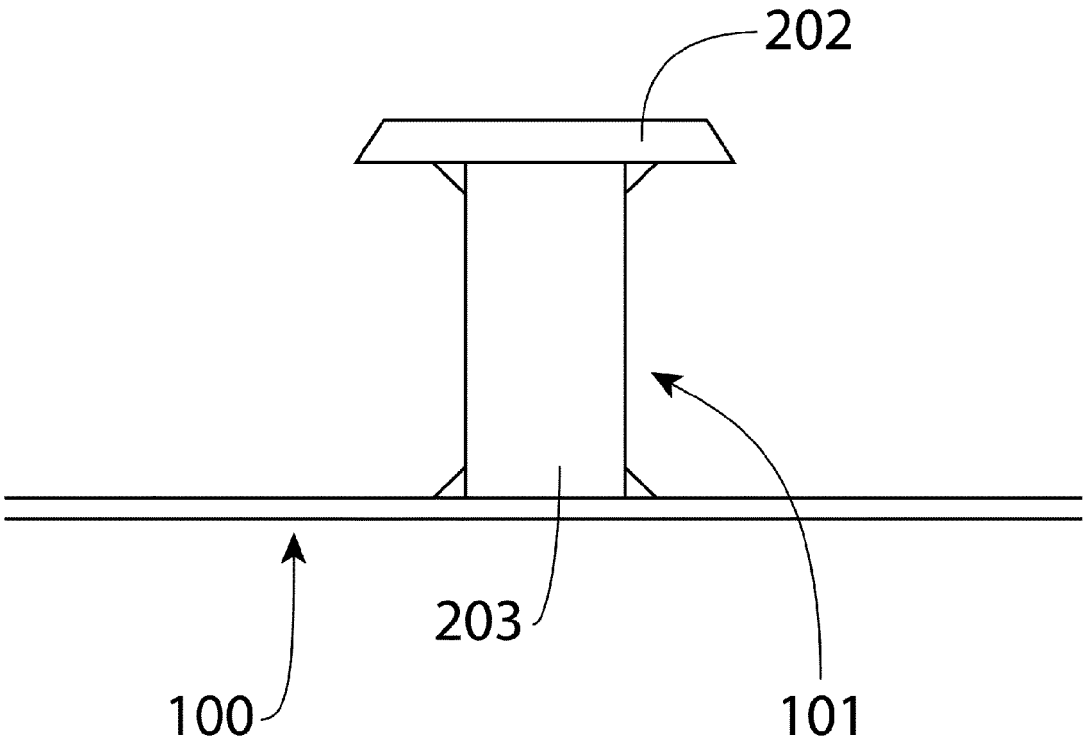


Fig. 2

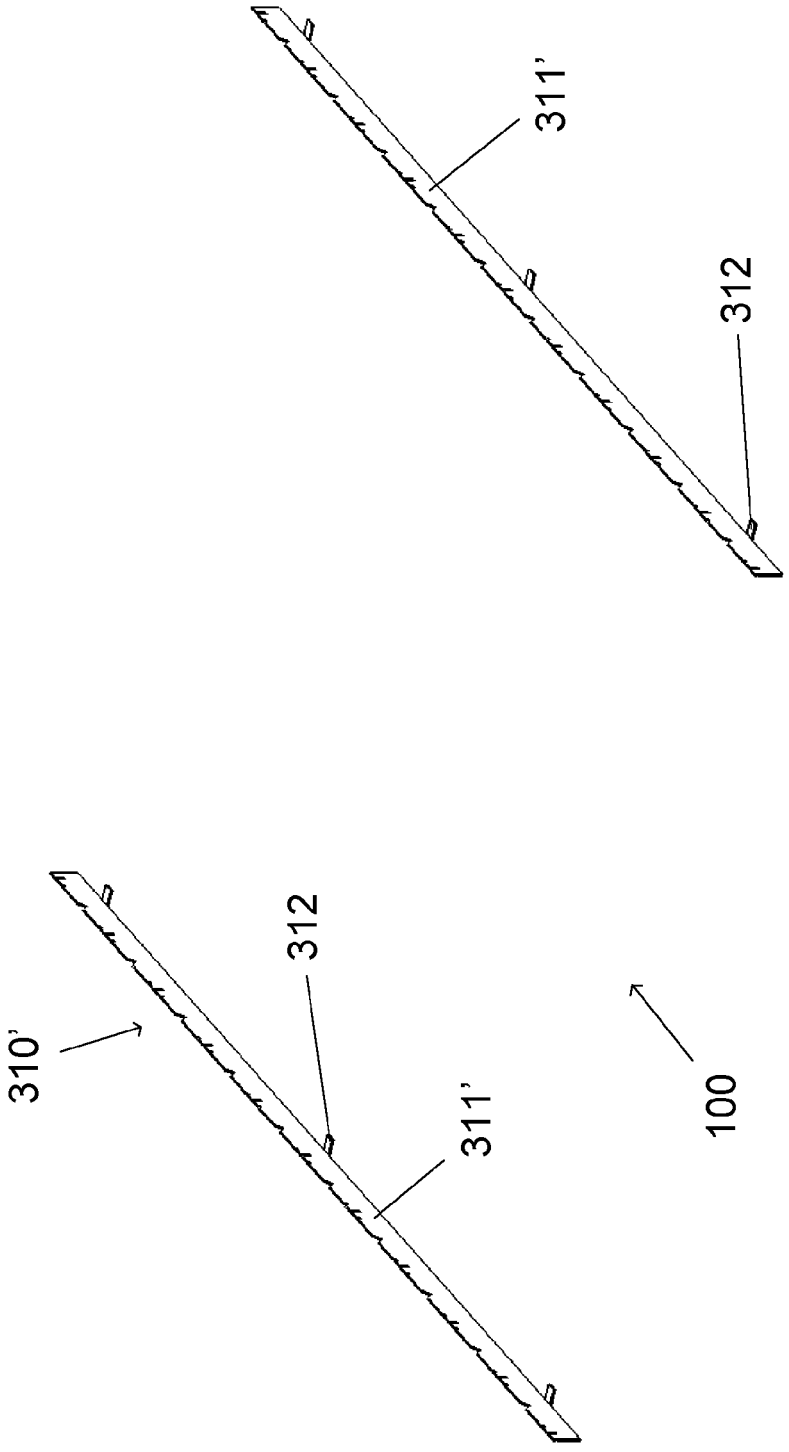


Fig 3A

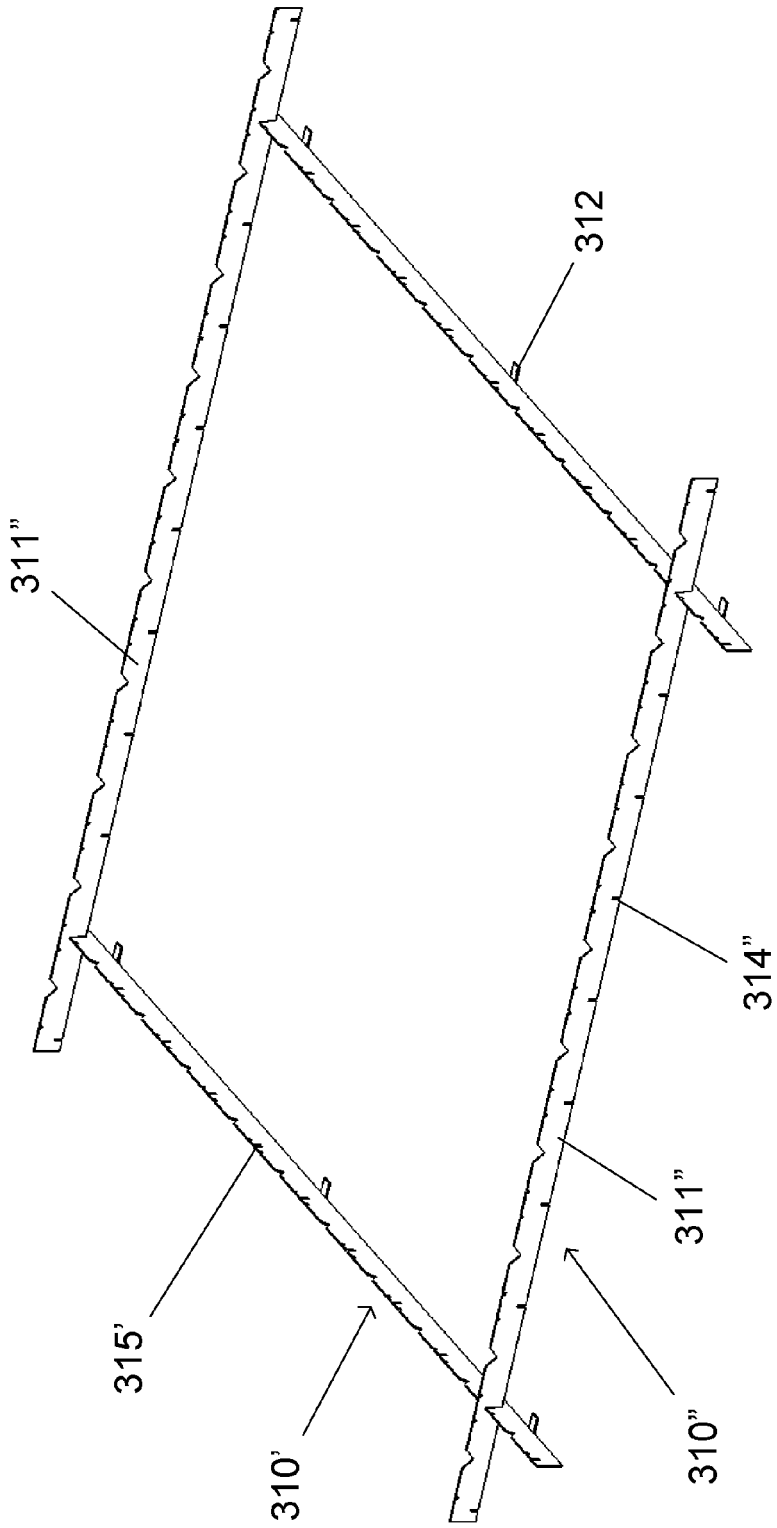


Fig. 3B

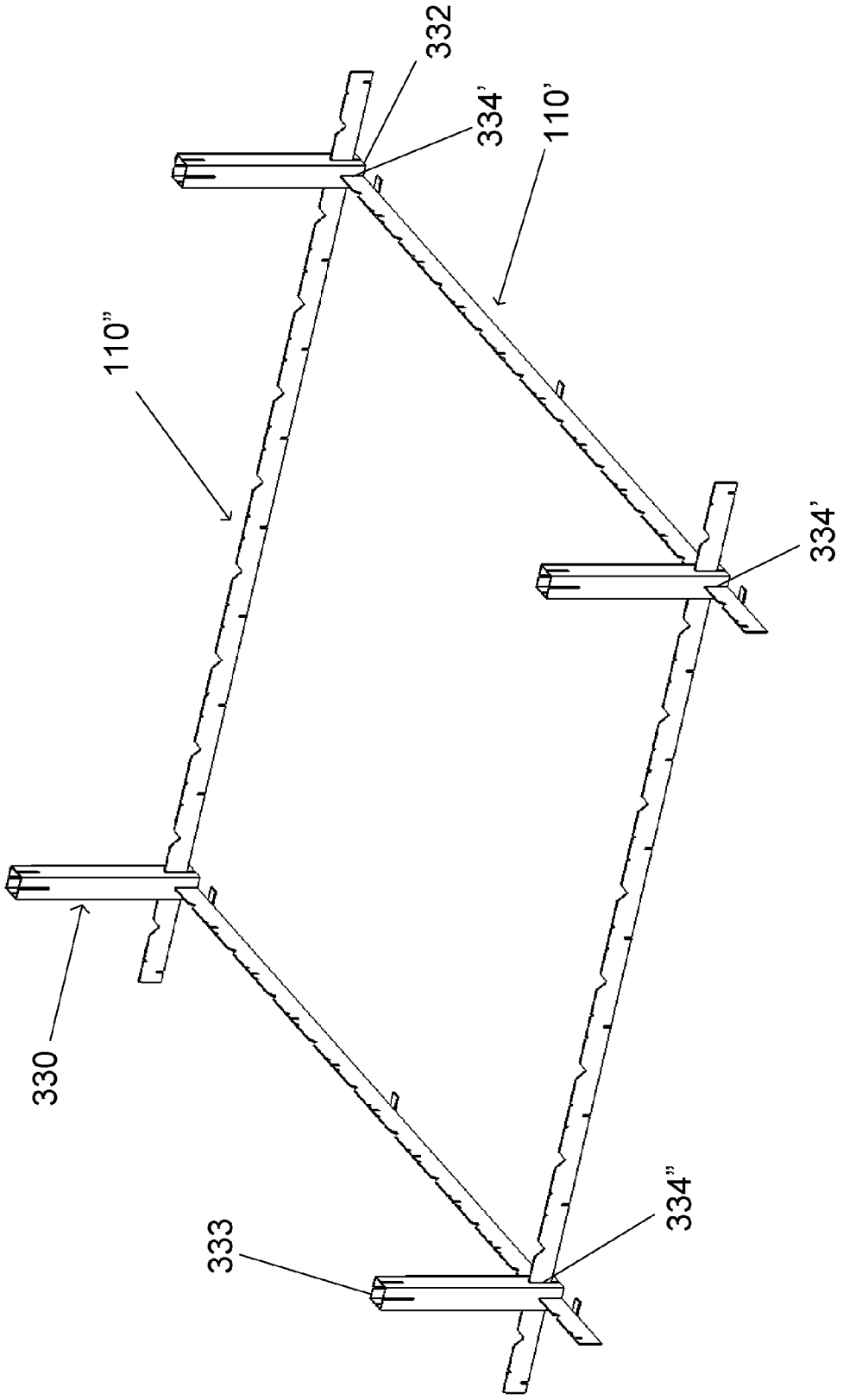


Fig. 3C

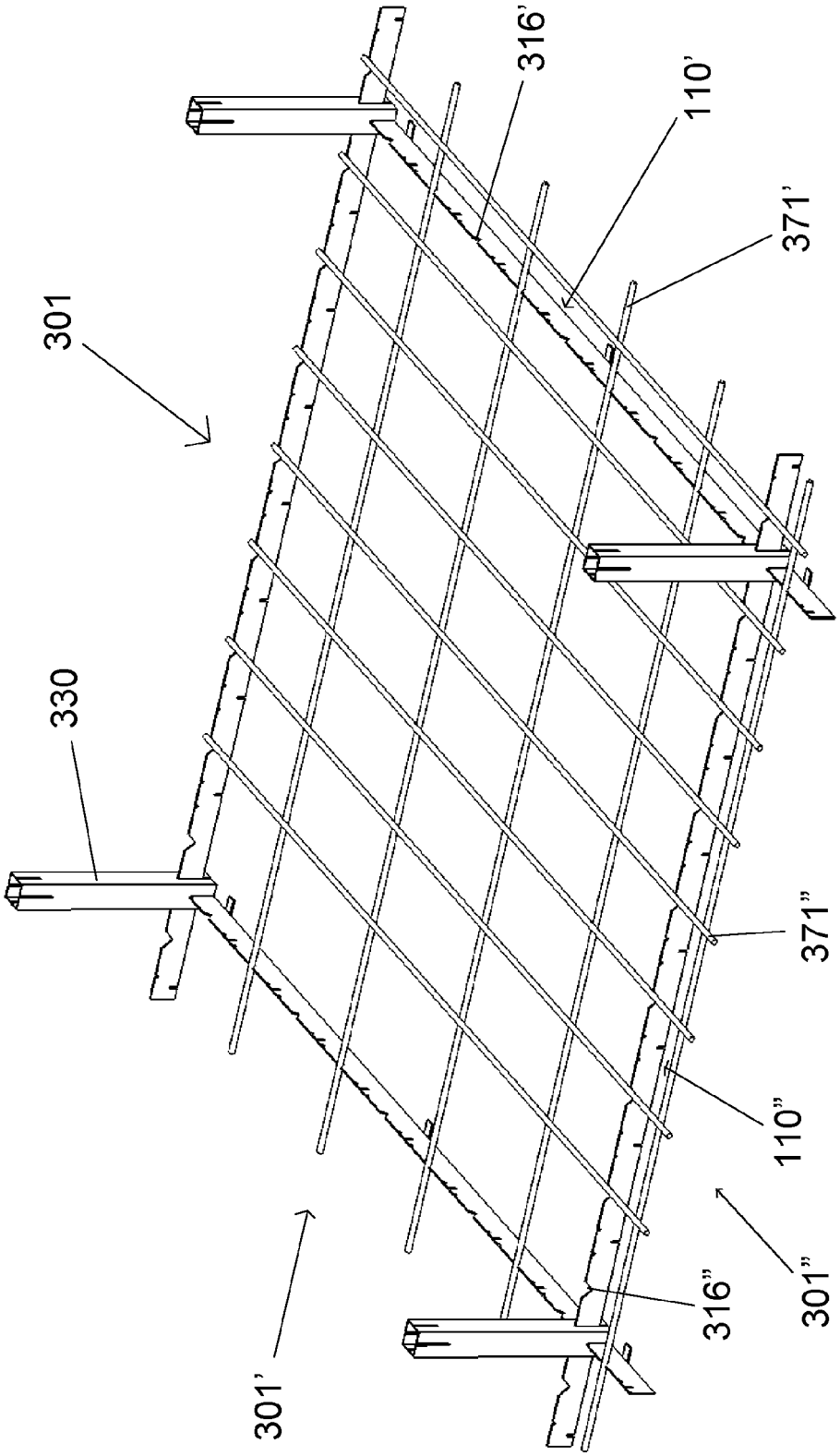


Fig. 3D

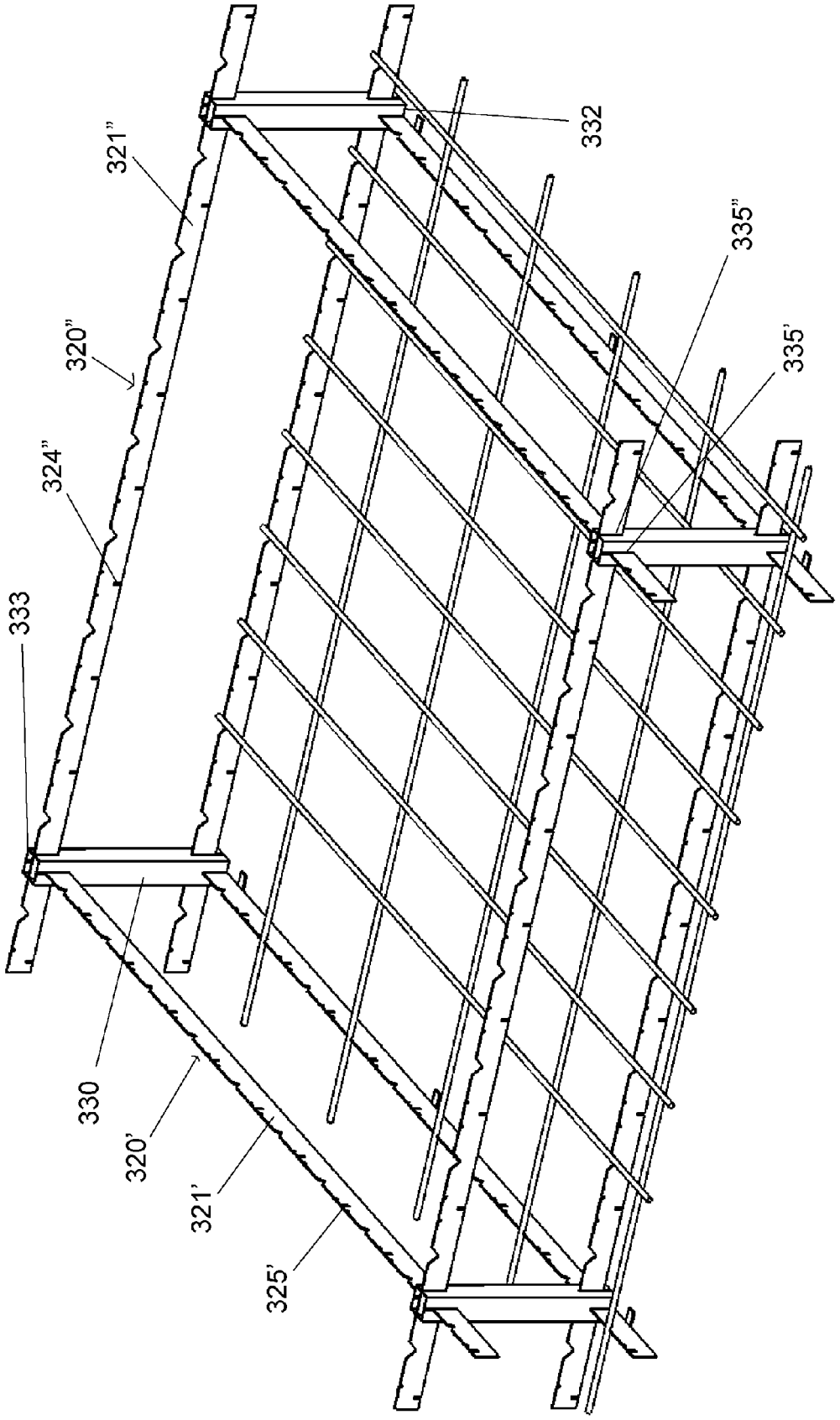


Fig. 3E

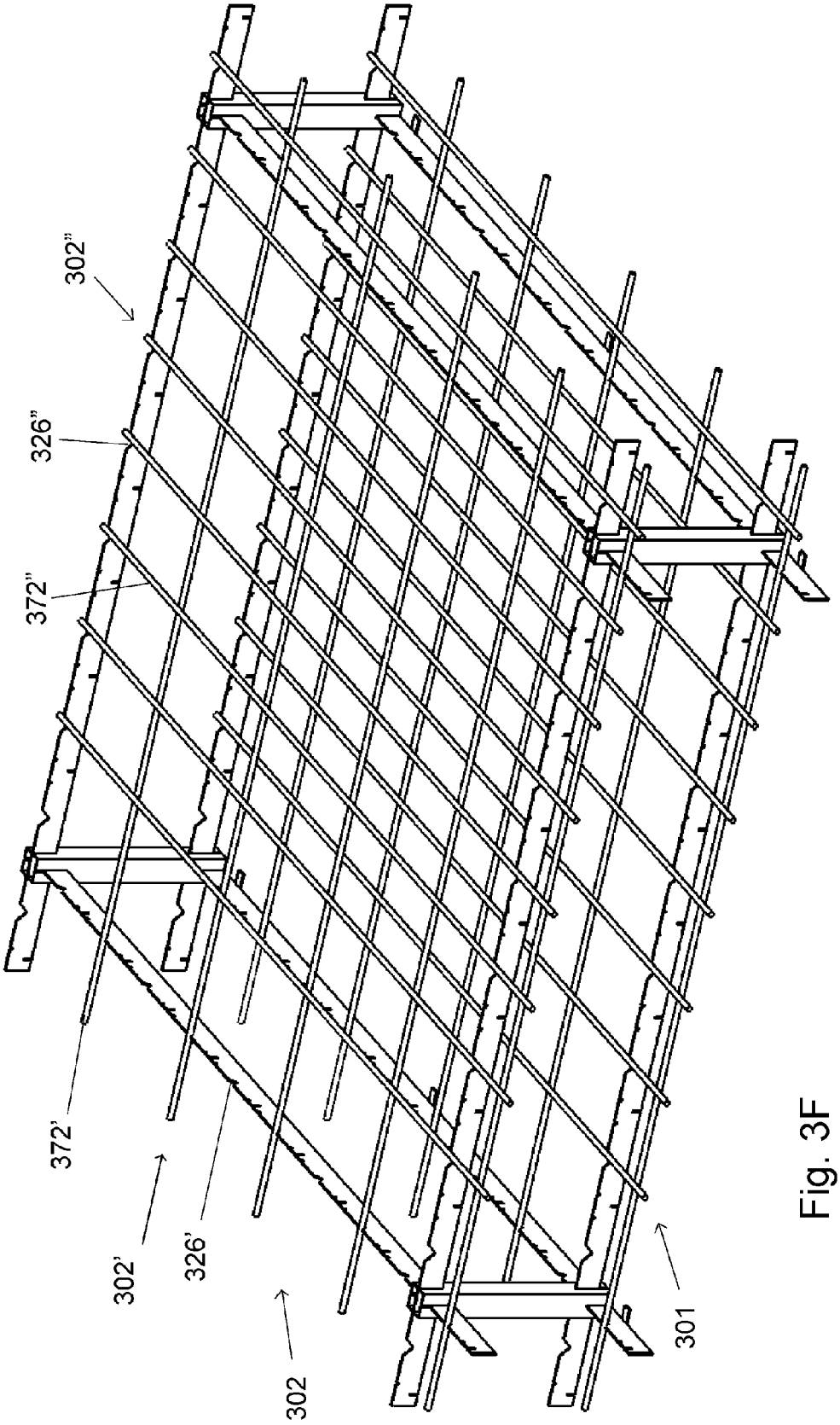


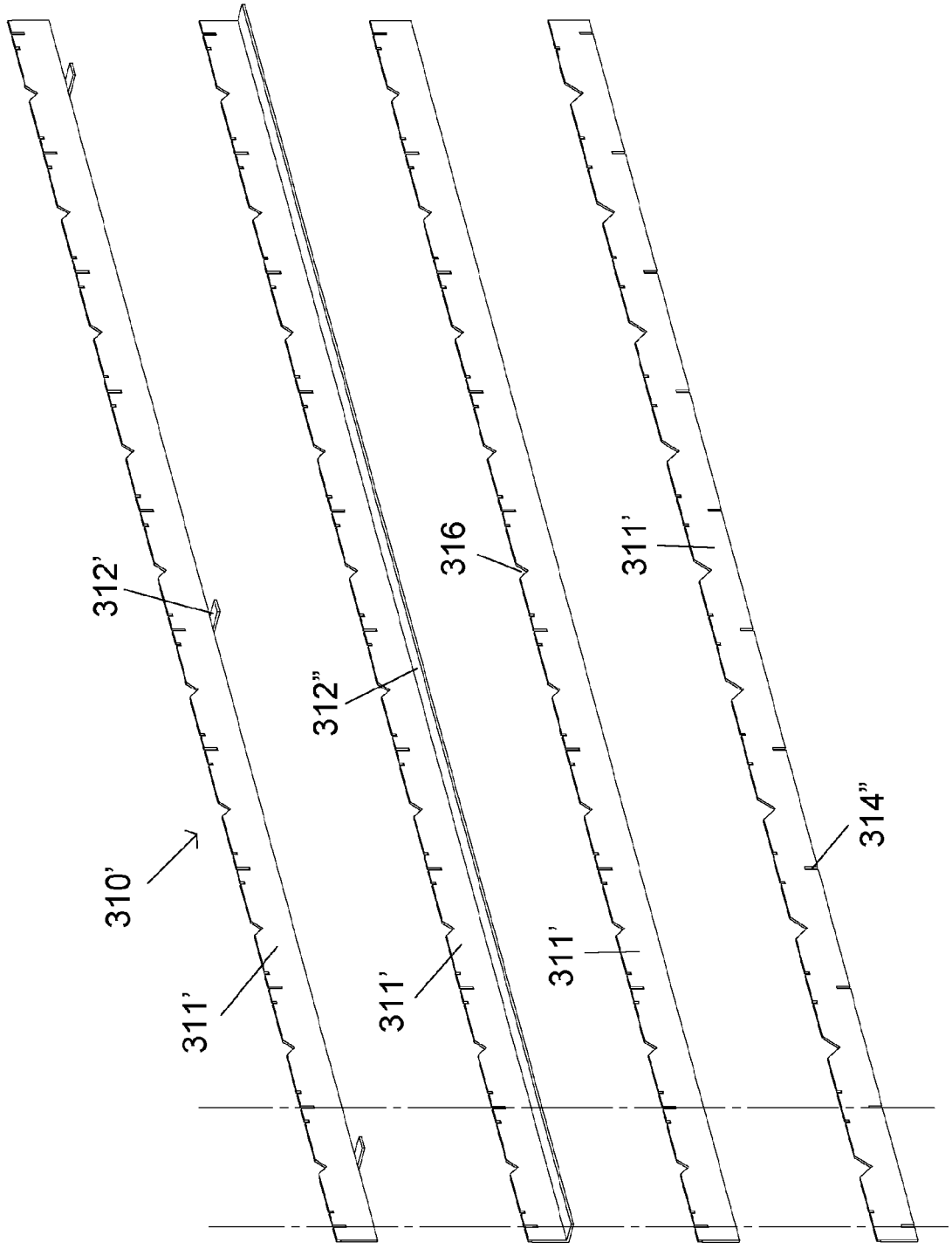
Fig. 3F

Fig. 4A

Fig. 4B

Fig. 4C

Fig. 4D



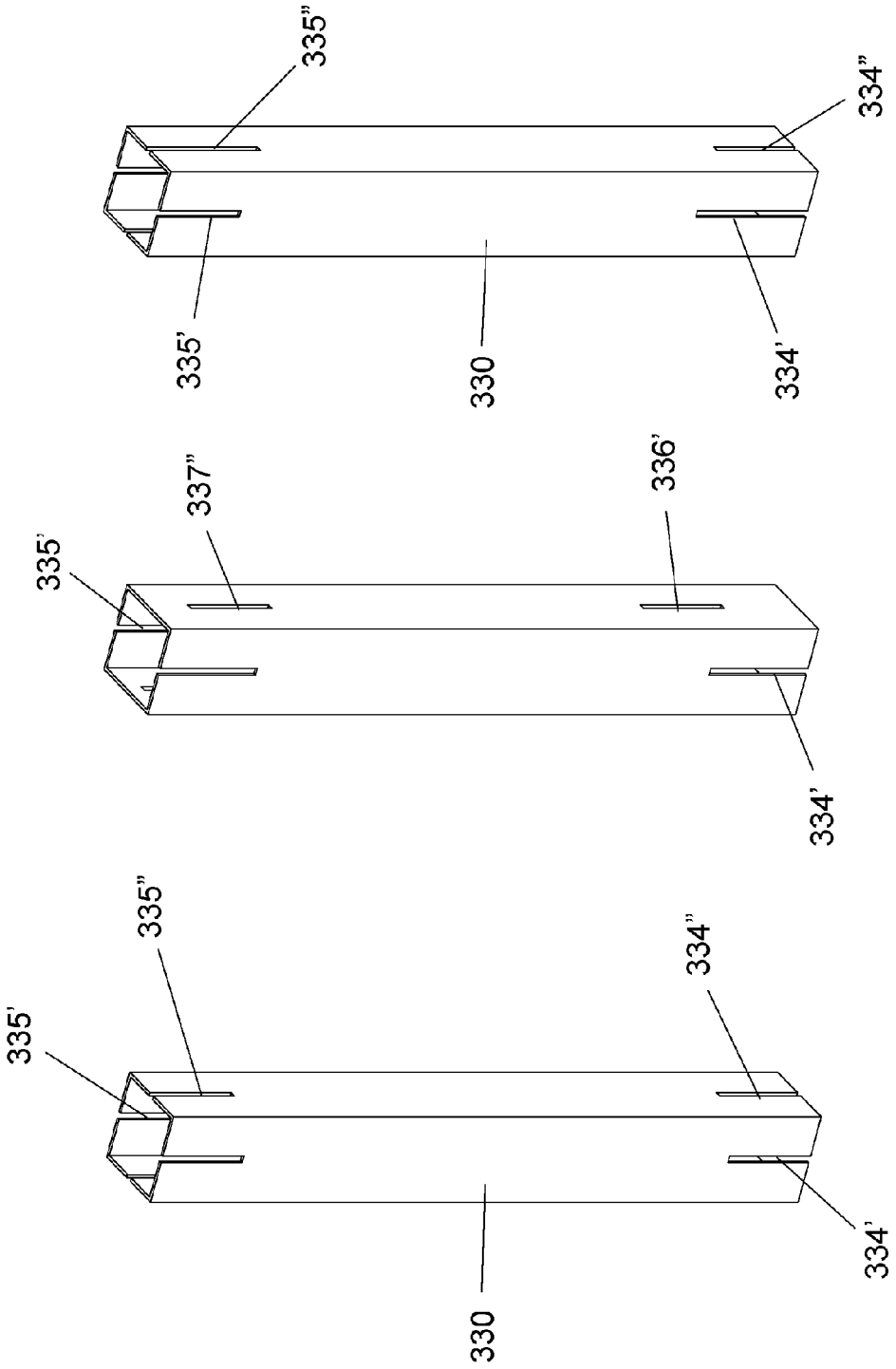


Fig. 5C

Fig. 5B

Fig. 5A

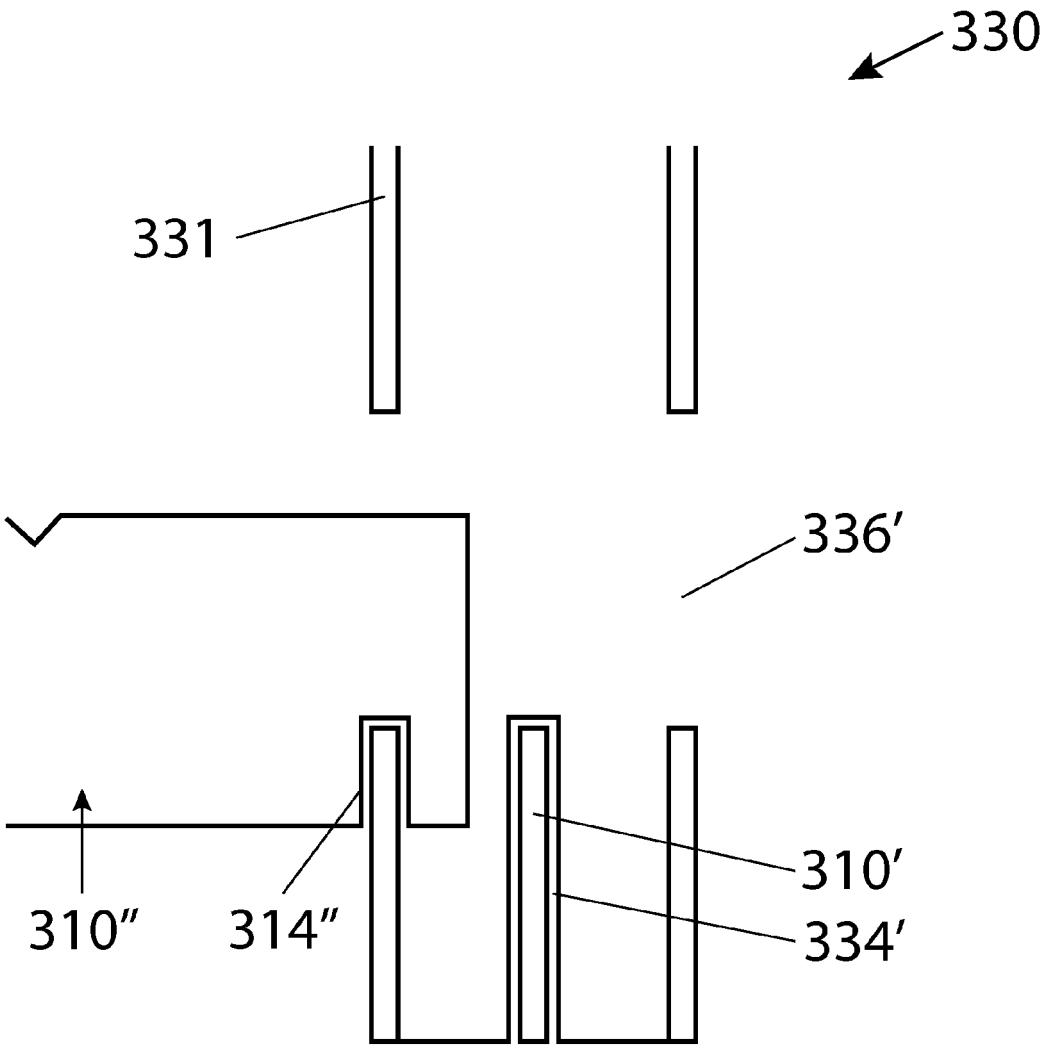


Fig. 6

Europäisches Patentamt
European Patent Office
Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 15 16 8551

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 A	GB 2 481 162 A (SEJONG CO. ET AL.) 14 December 2011 (2011-12-14) * paragraph [0035] - paragraph [0036]; figures 6,9,10,15 *	1-6,10, 11,15 7-9, 12-14	INV. E04C5/06 E04B5/32 E04C5/16 E02D27/08
A,D	JP 409 013 399 A (FUJIWARA AKINOBU) 14 January 1997 (1997-01-14) * abstract; figures *	1,4,5, 7-9	
A	WO 03/006757 A (D. HASLEM ET AL.) 23 January 2003 (2003-01-23) * abstract; figures *	1,11	
A	WO 2005/042865 A (NINE ARCHITECH CO.) 12 May 2005 (2005-05-12) * page 7, line 12 - line 20; figures *	1,5,7-11	

TECHNICAL FIELDS SEARCHED (IPC)
E04C E04B E02D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	7 August 2015	Righetti, Roberto

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

EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 15 16 8551

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

07-08-2015

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
GB 2481162 A	14-12-2011	AU 2010232082 A1	10-11-2011
		CN 102388191 A	21-03-2012
		DE 112010000467 T5	24-05-2012
		GB 2481162 A	14-12-2011
		JP 2012522913 A	27-09-2012
		KR 100971736 B1	21-07-2010
		US 2012023858 A1	02-02-2012
		WO 2010114288 A2	07-10-2010
JP 409013399 A	14-01-1997	---	---
WO 03006757 A	23-01-2003	AU 2002346087 A1	29-01-2003
		US 2003009978 A1	16-01-2003
		US 2003009979 A1	16-01-2003
		US 2004107668 A1	10-06-2004
		WO 03006757 A2	23-01-2003
WO 2005042865 A	12-05-2005	AU 2003277688 A1	19-05-2005
		WO 2005042865 A1	12-05-2005

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82