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(54) **METHOD AND APPARATUS FOR REBAR TYING**

(57) A method of providing a rebar in a wall cassette, said wall cassette comprising a pair of opposing, substantially parallel wall panels (1) having a void (3) therebetween, said wall panels being connected together in spaced apart relation by means of at least one cross tie (2), that extends across said void and comprises an elongate connector having a generally central opening therein, the method comprising the steps of providing at least first (5a) and second (6) rebar assemblies, each of said rebar assemblies comprising a pair of rebar rods connected together substantially in parallel and in spaced apart relation by means of at least one rigid spacer device (8), inserting, via an open end of said wall cassette, said first rebar assembly (5a) through an opening in a cross tie such that said rebar rods are substantially parallel to said wall panels (1), and inserting said second rebar assembly (6) through a second open end of said wall cassette and over said cross tie opening, said second open end being substantially orthogonal to said first open end, such that the longitudinal edges of said second rebar assembly (6) abut said first rebar assembly (5a) and prevent movement thereof relative to each other within said cross tie opening.

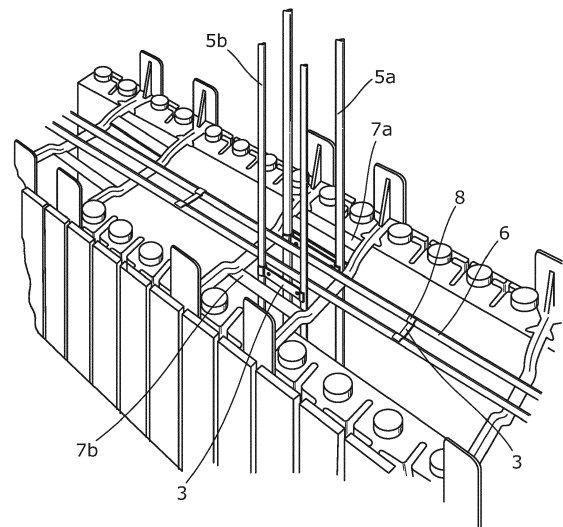


Fig. 3

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## Description

**[0001]** This invention relates generally to building systems, and more particularly, to a method and apparatus for the construction of walls, such as insulated walls, from pourable building material, such as concrete, using wall cassettes comprised of two opposed wall panels.

**[0002]** A known technique for the construction of walls from pourable building material (e.g. pourable concrete), comprises the use of a pair of opposed, usually insulating, wall panels (known as insulated concrete framework or ICF), formed of, for example, a foamed polymeric material, and held together in opposed, spaced-apart relation by a cross-tying system, thereby creating a central void which is filled with ready-mix concrete.

**[0003]** Referring to Figure 1 of the drawings, there is illustrated a schematic perspective view of a portion of an ICF wall, each wall section comprising two opposing insulated panels 1, connected together, and held in spaced-apart relation, by cross-ties 2 to define a central void 13 for receiving ready-mix concrete during the construction process. In many structures it may be required to reinforce the void 3 by means of a rebar which is a reinforcement bar, normally formed of carbon steel and used in reinforced concrete structures.

**[0004]** In order to satisfy engineering requirements, rebar needs to be restrained or tied to stop it moving during concrete pour.. In conventional construction techniques, ICF walls are assembled piece-by-piece on a building site, and rebar is tied together with steel wire as the wall is built up. However, more recently, it has become known to construct whole ICF wall sections (wall cassettes) which are built off-site and then transported and assembled onsite, and a method of retro-fitting a rebar to a completed pre-built ICF wall cassette is highly desirable.

**[0005]** Referring again to Figure 1 of the drawings, rebar can be inserted through the openings in the cross ties 2 such that the longitudinal axis thereof is parallel to the plane of the panels 1. However, since rebar is necessarily of significantly smaller diameter than the cross-tie opening, the cross tie is unable to retain the rebar in all directions. Furthermore, in a pre-built wall, there is no possibility of being able to tie the rebar in any way in order to retain it in position and provide a minimum cover stop in all movement planes.

**[0006]** In accordance with an aspect of the present invention, there is provided a method of providing a rebar in a wall cassette, said wall cassette comprising a pair of opposing, substantially parallel wall panels having a void therebetween, said wall panels being connected together in spaced apart relation by means of at least one cross tie, that extends across said void and comprises an elongate connector having a generally central opening therein, the method comprising the steps of providing at least first and second rebar assemblies, each of said rebar assemblies comprising a pair of rebar rods connected together substantially in parallel and in spaced apart relation by means of at least one rigid spacer device, in-

serting, via a first open end of said wall cassette, said first rebar assembly through an opening in a cross tie such that said rebar rods are substantially parallel to said wall panels, and inserting said second rebar assembly through a second open end of said wall cassette and over said cross tie opening, said second open end being substantially orthogonal to said first open end, such that the longitudinal edges of said second rebar assembly abut said first rebar assembly and prevent movement thereof relative to each other within said cross tie opening.

**[0007]** The method may comprise the further step of providing a third rebar assembly, comprising a pair of rebar rods connected together substantially in parallel and in spaced apart relation by means of at least one rigid spacer device, inserting, via said first open end of said wall cassette, said third rebar assembly through said opening in said cross tie such that said rebar rods are substantially parallel to said wall panels, and inserting said second rebar assembly through said second open end of said wall cassette, over said cross tie opening and through a gap between said first and third rebar assemblies, such that the longitudinal edges of said second rebar assembly abut said first and third rebar assemblies respectively and prevent movement thereof relative to each other within said cross tie opening.

**[0008]** The method may include the step of assembling the first and third rebar assemblies such that the effective width thereof is substantially equal to the width of said cross tie opening. The method may include the step of assembling the second rebar assembly such that the effective width thereof is substantially equal to the gap between the first and third rebar assemblies when they are abutted against opposing ends of said cross tie opening. In this case, the method may comprise the step of inserting the second rebar assembly at an angle relative to its principal horizontal plane, through said second open end of said wall cassette, over said cross tie opening and through a gap between said first and third rebar assemblies, and then rotating said second rebar assembly such that its principal plane is substantially horizontal and parallel to the plane of the cross tie, such that the longitudinal edges of said second rebar assembly abut said first and third rebar assemblies respectively and prevent movement thereof relative to each other within said cross tie opening.

**[0009]** The wall cassette may comprise a pre-fabricated ICF wall cassette comprising a pair of opposing parallel panels of foamed insulating material, such as foamed polymeric material, having a void therebetween and being connected together in spaced apart relation by means of one or more cross ties which extend between said opposing panels and have a generally central opening therein.

**[0010]** The spacer device may comprise an elongate bar having, at opposing ends thereof, connection portions for enabling rebar rods to be connected thereto. Such connection portions may be configured to engage

respective rebar rods in a snap-fit engagement. The spacer device may additionally, or alternatively, have one or more apertures therein to enable said rebar rods to be tied thereto by means of, for example, steel wire or the like.

**[0011]** A further aspect of the present invention extends to a rebar assembly for use in the above-defined method, the rebar assembly comprising at least two elongate rebar rods, connected together substantially in parallel and in spaced apart relation by means of at least one rigid spacer device. The rebar assembly may comprise at least two elongate rebar rods, connected together substantially in parallel and in spaced apart relation by means of a plurality of rigid spacer devices which are spaced apart along the length of the rebar assembly to form a ladder-like configuration.

**[0012]** Embodiments of the present invention will now be described by way of examples only and with reference to the accompanying drawings, in which:

Figure 1 is a schematic perspective view of a portion of an ICF wall;

Figure 2 is a schematic illustration of a pair of rebar assemblies for use in an embodiment of the present invention;

Figure 2a is a schematic perspective view of a rebar spacer for use in constructing a rebar assembly of Figure 2; and

Figure 3 is a schematic perspective view of a portion of an ICF wall illustrating a rebar tying method according to an exemplary embodiment of the present invention.

**[0013]** Referring to Figure 2 of the drawings, a rebar assembly for use in an exemplary embodiment of the present invention comprises a pair of rebar rods 3 connected together in parallel, and retained in spaced-apart relation, by a plurality of spacer bars 4 to form a "ladder" like assembly.. The rebar rods and the spacer bars may be made of carbon steel, for example, but the invention is in no way intended to be limited in this regard. For example, the spacer bars may be formed of suitable plastic material.

**[0014]** Referring to Figure 2a of the drawings, a spacer bar 4 comprises a pair of substantially semi-circular clips 8 at opposing ends of a central bar 8a. The clips 8 are shaped and configured to receive the rebar rods 3 in a self-retaining snap-fit connection, but one or more holes 8b may be provided for tying the rebar rods to the spacer bar 4 with steel wire if necessary. In the example shown, the central bar 8a is a single bar, but it may be made in doubles or more.

**[0015]** Referring to Figure 3 of the drawings, in use, a first rebar assembly 5a is lowered into the void 3 between the panels 1 of the wall cassette such that it passes

through the opening in a cross tie 2, and can be leaned against a tie crossbar 7a. A second rebar assembly 5b is also lowered into the void 3 between the panels 1 of the wall cassette such that it passes through the opening in a cross tie 2, and can be leaned against the opposing tie crossbar 7b. A third rebar assembly 6 is then inserted from the side of the wall cassette into the void 3 between the panels 1 such that it passes over the cross tie 2 and through the gap between the first and second rebar assemblies 5a, 5b. The third rebar assembly 6 is inserted at an angle to the horizontal plane thereof, such that it easily passes through the gap between the first and second rebar assemblies 5a, 5b and is then rotated such that its plane is substantially orthogonal to that of first and second rebar assemblies 5a, 5b. The effective width of the third rebar assembly 6 is such that, when it is rotated into this position, its longitudinal edges abut the first and second rebar assemblies respectively, thereby retaining the first and second rebar assemblies in position against the respective tie crossbars 7a, 7b. Thus, the horizontal "ladder" traps the vertical "ladders" against the tie crossbars 7a, 7b, thereby restraining or tying the bars in all four horizontal directions of movement.

**[0016]** It will be appreciated that, since the space between the rods of the first and second rebar assemblies 5a, 5b is such that the effective width of the assemblies is about the same as the width of the opening in the cross tie 2, and the effective width of the third rebar assembly 6 is about the same as the remaining gap between the first and second rebar assemblies when they are in position against the respective tie crossbars 7a, 7b, the first and second rebar assemblies are effectively retained between the tie crossbars 7a, 7b and the third rebar assembly 6. In other words, the rebar assemblies are held in all four movement directions by the assembly process described.

**[0017]** It will be apparent to a person skilled in the art that modifications and variations can be made to the described embodiments without departing from the scope of the invention as claimed.

## Claims

1. A method of providing a rebar in a wall cassette, said wall cassette comprising a pair of opposing, substantially parallel wall panels having a void therebetween, said wall panels being connected together in spaced apart relation by means of at least one cross tie, that extends across said void and comprises an elongate connector having a generally central opening therein, the method comprising the steps of providing at least first and second rebar assemblies, each of said rebar assemblies comprising a pair of rebar rods connected together substantially in parallel and in spaced apart relation by means of at least one rigid spacer device, inserting, via a first open end of said wall cassette, said first rebar assembly through an

- opening in a cross tie such that said rebar rods are substantially parallel to said wall panels, and inserting said second rebar assembly through a second open end of said wall cassette and over said cross tie opening, said second open end being substantially orthogonal to said first open end, such that the longitudinal edges of said second rebar assembly abut said first rebar assembly and prevent movement thereof relative to each other within said cross tie opening.
2. A method according to claim 1, comprising the further step of providing a third rebar assembly, comprising a pair of rebar rods connected together substantially in parallel and in spaced apart relation by means of at least one rigid spacer device, inserting, via said first open end of said wall cassette, said third rebar assembly through said opening in said cross tie such that said rebar rods are substantially parallel to said wall panels, and inserting said second rebar assembly through said second open end of said wall cassette, over said cross tie opening and through a gap between said first and third rebar assemblies, such that the longitudinal edges of said second rebar assembly abut said first and third rebar assemblies respectively and prevent movement thereof relative to each other within said cross tie opening.
3. A method according to claim 1 or claim 2, including the step of assembling the first and third rebar assemblies such that the effective width thereof is substantially equal to the width of said cross tie opening. The method may include the step of assembling the second rebar assembly such that the effective width thereof is substantially equal to the gap between the first and third rebar assemblies when they are abutted against opposing ends of said cross tie opening. In this case, the method may comprise the step of inserting the second rebar assembly at an angle relative to its principal horizontal plane, through said second open end of said wall cassette, over said cross tie opening and through a gap between said first and third rebar assemblies, and then rotating said second rebar assembly such that its principal plane is substantially horizontal and parallel to the plane of the cross tie, such that the longitudinal edges of said second rebar assembly abut said first and third rebar assemblies respectively and prevent movement thereof relative to each other within said cross tie opening.
4. A method according to any preceding claim, wherein the wall cassette comprises a pre-fabricated ICF wall cassette comprising a pair of opposing parallel panels of foamed insulating material, such as foamed polymeric material, having a void therebetween and being connected together in spaced apart relation by means of one or more cross ties which extend between said opposing panels and have a generally central opening therein.
5. A method according to any preceding claim, wherein the spacer device comprises an elongate bar having, at opposing ends thereof, connection portions for enabling rebar rods to be connected thereto.
6. A method according to claim 5, wherein the connection portions are configured to engage respective rebar rods in a snap-fit engagement.
7. A method according to any preceding claim, wherein the spacer device has one or more apertures therein to enable said rebar rods to be tied thereto.
8. A rebar assembly for use in the method according to any of the preceding claims, the rebar assembly comprising at least two elongate rebar rods, connected together substantially in parallel and in spaced apart relation by means of at least one rigid spacer device.
9. A rebar assembly according to claim 8, comprising at least two elongate rebar rods, connected together substantially in parallel and in spaced apart relation by means of a plurality of rigid spacer devices which are spaced apart along the length of the rebar assembly to form a ladder-like configuration.
10. A method of providing a rebar in a wall cassette substantially as herein described with reference to Figures 2, 2a and 3 of the drawings.

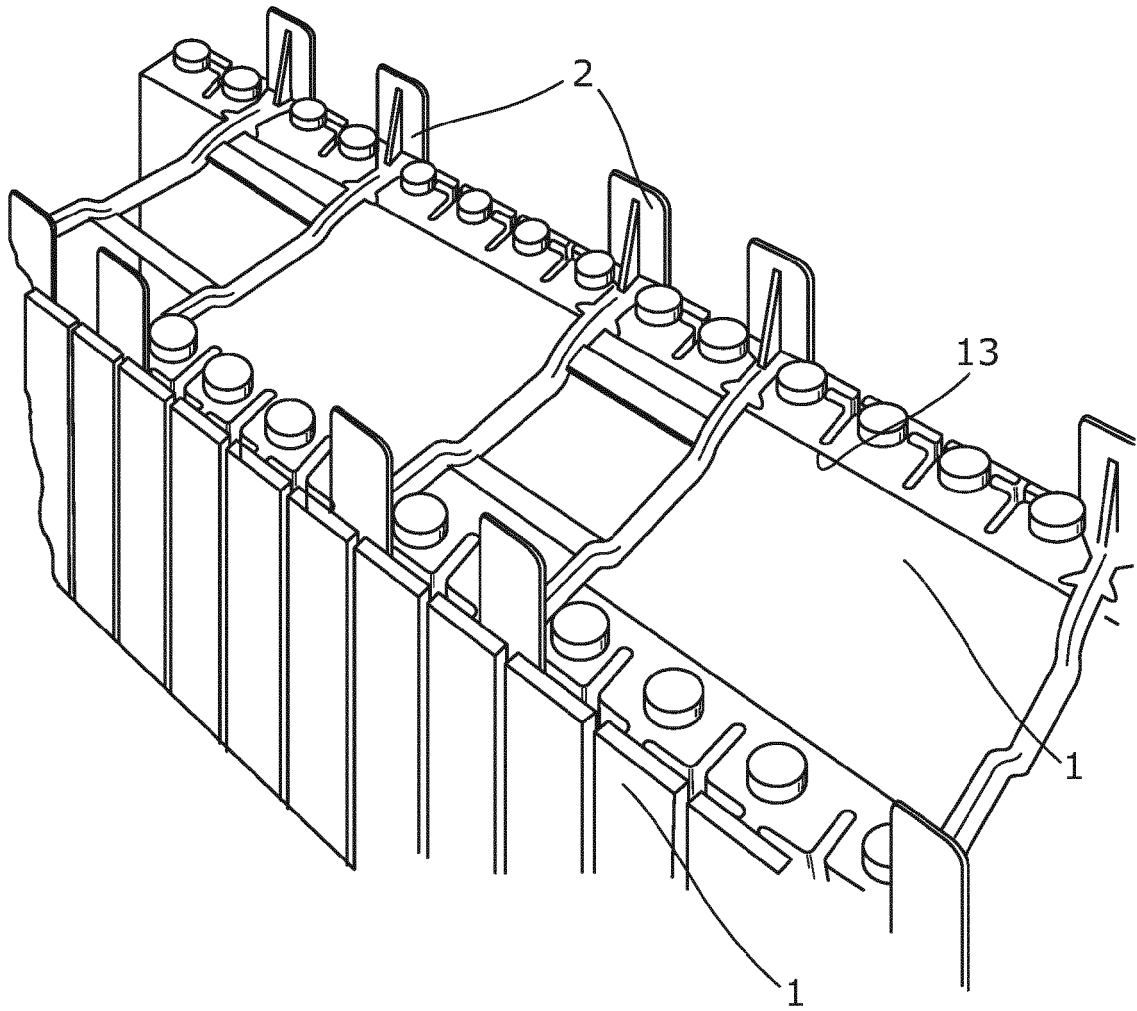


Fig. 1

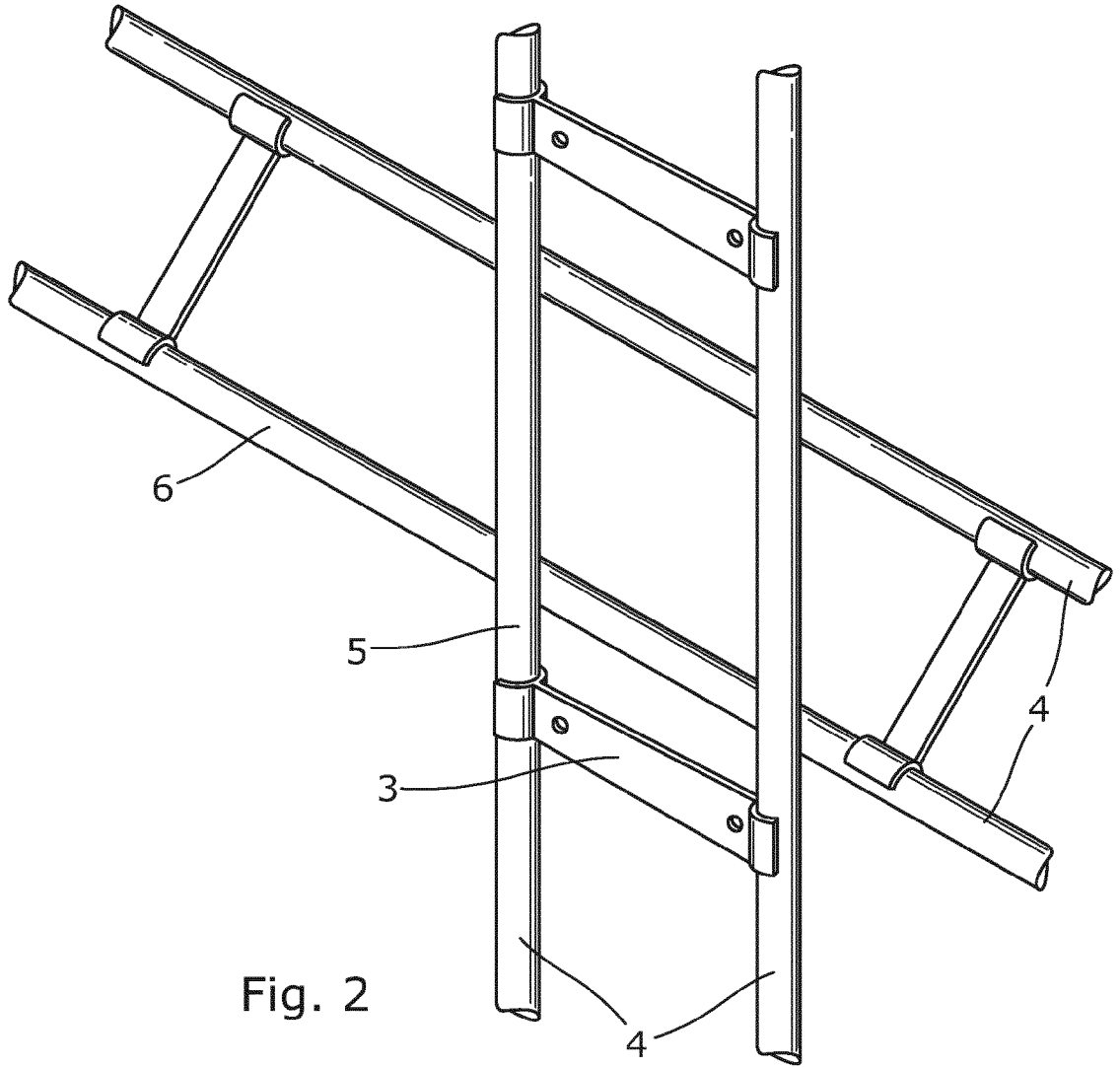


Fig. 2

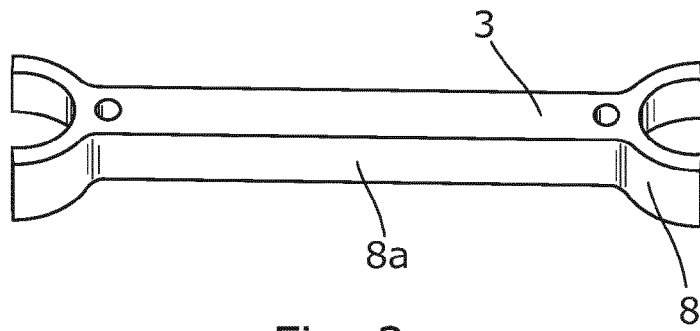


Fig. 2a

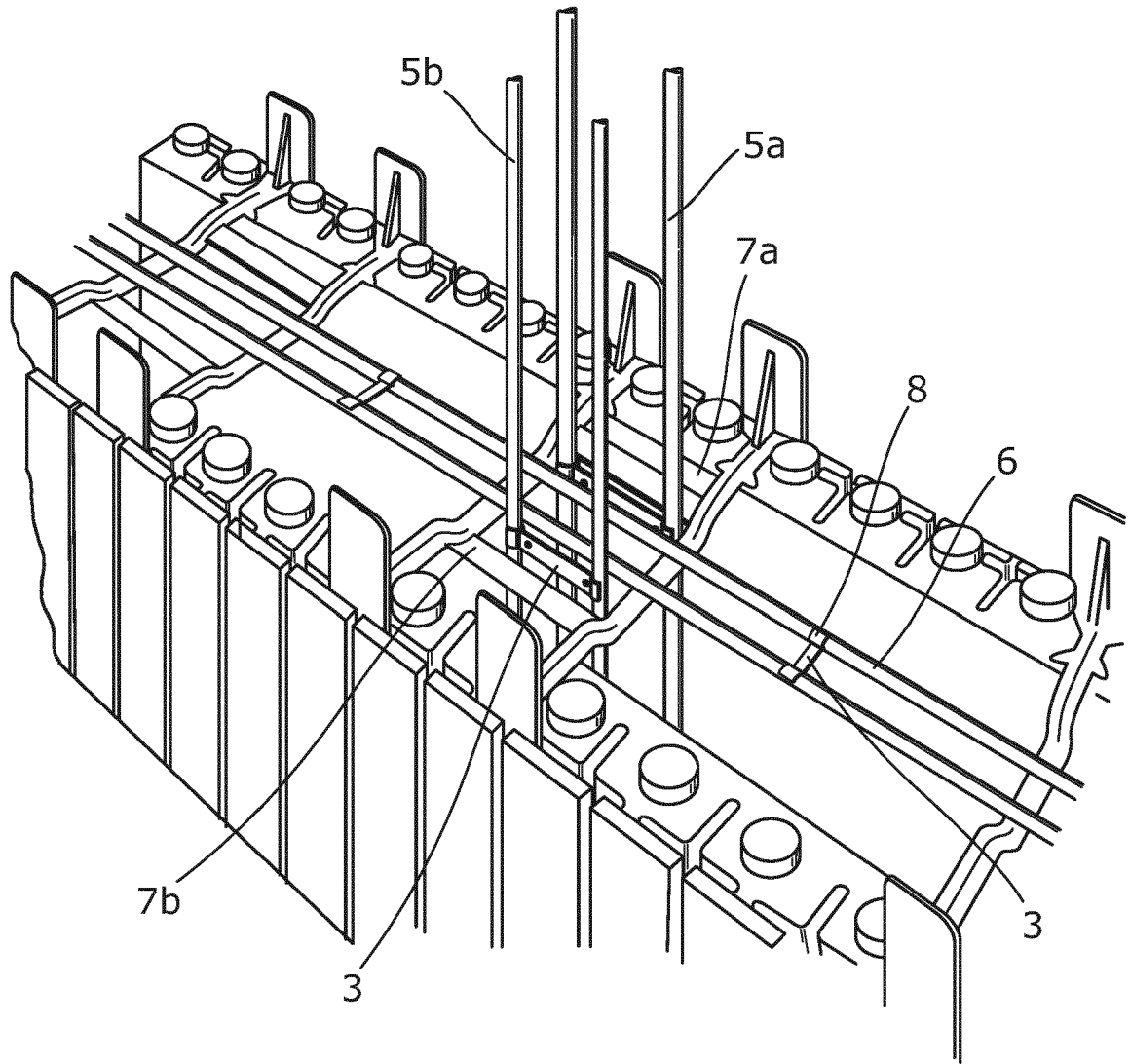


Fig. 3



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Application Number  
EP 15 16 7005

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CATEGORY OF CITED DOCUMENTS		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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