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(54) **A foundation and rising wall insulated construction system**

(57) the present invention provides a combined foundation and rising wall construction system which includes a pair of opposed stepped insulating panels and a plurality of tie members securing the panels in a spaced relationship to one another such that concrete may be poured into an enclosure defined between the panels to create an insulated monolithic foundation and rising wall. In addition to a method of constructing a monolithic foundation and rising wall, the method comprising securing a pair of stepped insulation panels in spaced relationship to one another, locating the pair of panels on a surface so as to define an enclosure, and pouring concrete into the enclosure to form the monolithic foundation and rising wall. <Figure 1>

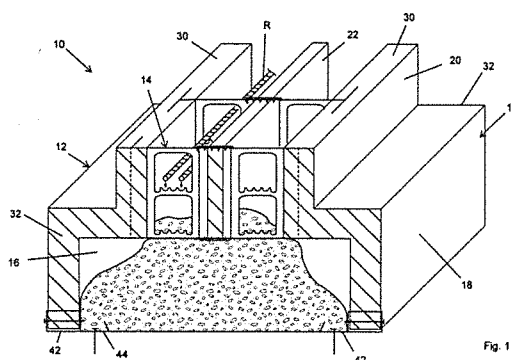


Fig. 1

A Foundation and Rising Wall Insulated Construction System

Field of the invention

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The present invention relates to a foundation and rising wall insulated construction system for use in simultaneously forming a thermally insulated monolithic poured concrete foundation and rising wall to floor level and which has particular application in providing a significant thermal break in order to reduce the flow of thermal energy from the interior to the exterior of a building, in particular at the interface between the wall foundation and internal flooring. The system may however also be used in the construction of a foundation and rising wall for constructing a boundary wall or any other construction suitable to be formed with the system of the invention.

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15 Background of the invention

When constructing a wall at ground level, for example when constructing a building or the like, the first phase in the construction process is generally the formation of the foundation of the wall. These foundations will support the above ground portion of the walls, and will also provide a certain level of thermal insulation to the structure in the case of constructing a building. The most common method employed for this procedure is to first dig a trench to the required depth to define the location of the wall, whether for the construction of a building otherwise. This trench is then filled with poured concrete to a depth below the top of the trench. The poured concrete must then be allowed to set, following which a so called "rising wall" is then built on top of the concrete foundation up to or close to floor level. The rising wall is generally formed from conventional block work. This rising wall then forms a base onto which load bearing walls of the building are built, whether external or internal walls, and which must therefore, together with the poured concrete foundation, support the loads imparted by the finished building. As an alternative to trench form of construction described above it is also common, in particular when unsuitable ground conditions exist at the construction site, to use piled foundations onto which a poured concrete foundation may then be located before constructing the rising wall.

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It is therefore an object of the present invention to provide a combined foundation and rising wall construction system which significantly reduces the time and effort to construct the above mentioned foundation and rising wall, while also improving the structural and thermal insulation properties of the finished foundation and rising wall.

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Summary of the invention

According to a first aspect of the present invention there is provided a combined foundation and rising wall construction system comprising a pair of opposed stepped insulating panels; and a
5 plurality of tie members securing the panels in spaced relationship to one another such that concrete may be poured into an enclosure defined between the panels to create an insulated monolithic foundation and rising wall.

10 Preferably, each panel has a substantially Z shaped cross section.

Preferably, each panel comprises an L shaped portion defining the foundation and an upstanding portion extending from the L shaped portion and defining the rising wall.

15 Preferably, each panel comprises an upright disposed in parallel spaced relationship to the upstanding portion such as to define a channel therebetween for receiving poured concrete.

Preferably, the upstanding portion is greater in height than the upright.

20 Preferably, each panel is formed from polystyrene.

Preferably, the construction system comprises an insulation insert locatable in the enclosure between and parallel to the pair of panels.

25 Preferably, the insert is elongate and extends longitudinally of the enclosure.

Preferably, the insert is located between the pair of upstanding portions of the panels.

30 Preferably, the insert extends substantially vertically between the pair of upstanding portions of the panels.

Preferably, the insert extends substantially horizontally between the pair of upstanding portions of the panels.

35 Preferably, each tie member defines a recess for receiving the insert.

Preferably, each tie member comprises a releasably retained closure member defining an upper end of the recess.

40 Preferably, the tie members are formed from a polymer.

Preferably, each panel comprises pre-formed slots along an inner face of the panel for receiving an end of the tie.

Preferably, the tie members extend between the upstanding portion of each of the pair of panels.

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Preferably, each tie members defines at least one socket for receiving a reinforcing element.

Preferably, the construction system comprises a plurality of shoes which project into or outwardly away from the enclosure from a lower edge of each of the panels.

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Preferably, the construction system comprises a plurality of reinforcing elements locatable within the enclosure.

Preferably, the construction system comprises an insulated floor panel comprising an upstanding rim.

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Preferably, the floor panel is formed integrally with one of the stepped panels.

Preferably, the construction system comprises one or more floor components supported by one or more of the panels.

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Preferably, the construction system comprises a damp proof membrane provided about at least a part of a face of at least one of the panels.

Preferably, at least a part of an inner face of at least one of the panels comprises one or more keyways formed therein.

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Preferably, at least a part of a surface of at least one of the panels comprises castellations to facilitate interlocking like panels together.

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Preferably, the pair of opposed panels are oriented such that the enclosure defined therebetween is in the form of an inverted T shape.

Preferably, at least one of the stepped panels comprises a port permitting access to the enclosure.

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According to a second aspect of the present invention there is provided a method of constructing a monolithic foundation and rising wall, the method comprising securing a pair of stepped insulation panels in spaced relationship to one another; locating the pair of panels on a surface so as to define an enclosure; and pouring concrete into the enclosure to form the monolithic foundation and rising wall.

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Preferably, the method comprises pouring concrete into a channel formed on an exterior of one or both of the panels.

Preferably, the method comprises locating the pair of panels in a trench dimensioned such that an upper face of the rising wall is approximately at floor level.

Preferably, the method comprises locating the pair of panels above a piled foundation.

Preferably, the method comprises locating an insulation insert between the pair of panels to be encased in the poured concrete.

Preferably, the method comprises pouring concrete to partially fill the enclosure before locating the insulation insert in the enclosure; and fully filling the enclosure such as to encase the insert in the poured concrete.

Preferably, the method comprises vibrating the poured concrete through a port in at least one of the stepped panels.

Preferably, the method comprises located a plurality of reinforcing elements in the enclosure prior to filling the enclosure with concrete.

Preferably, the method comprises supporting one or more floor components by one or more of the panels.

As used herein, the term "Z shaped" is intended to mean a component that has a cross section with a first substantially planar wall, a second substantially planar wall extending perpendicularly from at or adjacent one end of the first wall, and a third substantially planar wall extending perpendicularly from at or adjacent an end of the second wall opposite to the end at which the first wall meets, the third wall being substantially parallel to the first wall. It will also be understood that the joining walls may extend from one another at an angle off perpendicular, and that additional walls may be included provided that the core Z shaped section is present.

Brief description of the drawings

The present invention will now be described with reference to the accompanying drawings, in which:

Figure 1 illustrates a perspective view of a combined foundation and rising wall construction system according to a first embodiment of the present invention;

Figure 2 illustrates a perspective view of a tie member forming part of the combined foundation and rising wall construction system illustrated in Figure 1;

Figure 3 illustrates a schematic representation of the foundation construction system shown in Figure 1 contained as part of a complete foundation of a building;

5 Figure 4 illustrates an alternative form of the tie member illustrated in Figure 2;

Figure 5 illustrates a further alternative form of the tie member illustrated in Figure 2;

Figure 6 illustrates a sectioned end view of the combined foundation and rising wall showing optional
10 removable plugs;

Figure 7 illustrates a sectioned view of a combined foundation and rising wall according to a second embodiment of the present invention; and

15 Figure 8 illustrates a sectioned view of a combined foundation and rising wall according to a third embodiment of the present invention.

Detailed description of the drawings

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Referring now to Figures 1 to 6 of the accompanying drawings there is illustrated a first embodiment of a combined foundation and rising wall construction system, generally indicated as 10, for use in simultaneously forming a thermally insulated monolithic foundation and rising wall of a building or similar construction combining a poured concrete structure enclosed in insulation which acts both as
25 shuttering for the poured concrete and permanent insulation surrounding the concrete. The construction system 10 is particularly intended to be used to produce an above or below ground foundation combined with a rising wall.

The construction system 10 comprises a pair of panels 12 which have a stepped or substantially Z shaped profile or cross section and which in use are secured in spaced relationship to one another
30 by an array of tie members 14 extending between the panels 12 and preferably secured to each panel 12 via slots formed or otherwise cut into the panels 12. Plastic inserts (not shown) may be moulded into the panels 12 in order to receive an end of the tie member 14, which in the embodiment illustrated is T shaped in form but may be of any other suitable configuration.

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The system 10 is arranged with the pair of panels 12 being oriented as a mirror image of one another and as such define an inverted substantially T shaped enclosure 16 therebetween into which, in use, concrete is poured in order to form the monolithic foundation or footing and rising wall. The pair of panels 12 are formed from an insulating material, and in the preferred embodiment illustrated are
40 formed from polystyrene such as expanded or extruded polystyrene. The density of the polystyrene

or other insulation material may be varied as required to suit the particular application in terms of both thermal insulation performance and load bearing capacity.

Each panel 12 comprises a substantially L shaped portion 18 defining the foundation or lower part of the enclosure 16 and an upstanding portion 20 extending substantially vertically upwardly from the L shaped portion 18 and which in use defines the rising wall portion of the enclosure 16. It will be appreciated from the following description of the configuration and operation of the foundation construction system 10 that the exact shape and dimensions of the panels 12 may be varied as required without departing from the scope of the present invention. In addition the spacing between the panels 12 may be varied as required, and for example the tie members 14 may be arranged in pairs secured in end to end engagement by any suitable means, or may have inserts as described hereinafter, in order to increase the width of the space between the panels 12 to suit the particular foundation and rising wall being constructed.

The foundation construction system 10 optionally comprises an insulation insert 22 which is elongate in form and dimensioned to be located in the enclosure 16 between the pair of wall panels 12, and preferably in a vertical orientation and extending longitudinally of the enclosure 16 and thus in parallel to the wall panels 12. The insert 22 may however be arranged in a horizontal orientation between the pair of panels 12, and optionally two or more of the inserts 22 may be employed, or for example a T shaped insert (not shown) may be used which would therefore have both a vertically and a horizontally extending aspect. Where a horizontal insert is employed it may be positioned to be substantially flush with the upper face of the system 10. In a particularly preferred arrangement the insert 22 is positioned between the upstanding portion 20 of the pair of panels 12 in order to reduce or prevent thermal bridging across the rising wall portion of the finished monolithic construction.

The tie members 14 are therefore preferably provided with a centrally disposed recess 24 which is shaped and dimensioned for receiving the insert 22 in order to support and retain the insert 22 in the correct location within the enclosure 16. Each tie member 14 preferably comprises a releasably retained closure member 26 defining an upper end of the recess 24, which may thus be opened in order to provide access to the recess 24 in order to allow the insert 22 to be located therein. Once the insert 22 is positioned within the recess 24 the closure member 26 may then be closed in order to hold the insert 22 in position as concrete is poured into the enclosure 16 as hereinafter described. The insert 22 is preferably supported across at least two adjacent tie members 14.

The tie members 14 may also comprise one or more sockets 28 for receiving a reinforcing element such as steel rebar R or the like, again preferably extending longitudinally of the enclosure 16 and supported between adjacent tie members 14. The rebar R is secured in position before the concrete is poured into the enclosure 16 and will therefore be encased in the concrete at the completion of the construction system 10.

Thus in use a suitable number of opposed pairs of panels 12 are secured in end to end engagement with one another such as to define a foundation of a wall structure, for example for use in a building, and will thus generally be in the form of a closed perimeter defining the outer footprint of the building and/or inner walls of the building. In most cases a suitably dimensioned trench (not shown) is dug to receive this foundation, and in the case of the present invention such a trench is preferably formed having a width marginally wider than the overall width of the pair of panels 12 when secured to one another, and of a depth such that an upper face 30 of the upstanding portions 20 are located substantially at floor level, which may be above ground level where, for example, piling is used to create a suitable base on which to support the wall or other structure to be built.

Where conventional reinforcing elements such as steel rebar (not shown) or the like are to be incorporated into the foundation portion such reinforcing elements are first laid along the bottom of the trench or alternative surface on which the construction system 10 is placed. Once laid the pairs of opposed panels 12, as secured together by the tie members 14, are placed into the trench over such reinforcing elements, which will then be located within the enclosure 16 defined between the pair of panels 12 and the base of the trench. Adjacent pairs of panels 12 are located in end to end engagement with one another and are then suitably secured together, for example by means of couplings such as conventional metal combs (not shown) or the like secured across the interface between longitudinally adjacent panels 12. Additionally or alternatively the end faces 32 of the wall panels 12 may be provided with castellations covering some or all of the end face 32 and which castellations then interlock with like castellations on the adjacent panels 12 in order to provide additional interlocking between longitudinally adjacent panels 12.

Once the full length of the trench has been filled with pairs of opposed panels 12 concrete may then be poured into the enclosure 16 such as to form the monolithic foundation and rising wall. Where the insulation insert 22 is to form part of the foundation construction system 10, it is preferable for practical purposes that the insert 22 is initially removed from between the panels 12 in order to ease the process of pouring concrete into the lower of foundation portion of an enclosure 16. Figure 1 shows the lower foundation or footing portion of the enclosure 16 partially filled with concrete. Once the poured concrete has fully filled the lower portion of the enclosure 16 the closure member 26 of each tie member 14 is opened and the inserts 22 are then located within and between the recesses 24 of adjacent tie members 14, again preferably along the full length of the trench. The closure member 26 of each tie member 14 is then closed in order to retain the insert 22 in position.

At this point concrete can then be poured to fill the remaining space of the enclosure 16, with the recess 24 and closure member 26 holding the inserts 22 in position during the pour. The concrete is poured until it is flush with the upper face 30 of the upstanding portions 20, thereby encasing the steel reinforcing elements, the insert 22 and the tie members 14 to form a monolithic foundation and rising wall which is encased in insulating expanded or extruded polystyrene as defined by the panels 12. As the panels 12 form a shuttering which contain the poured concrete the entire volume of the trench does not then need to be filled with concrete as is conventionally done and thus there is a

reduction in the volume of concrete required to form the combined foundation and rising wall as defined by the construction system 10.

As the concrete is being poured into the enclosure 16 it may be subject to vibration using
 5 conventional equipment such as a poker (not shown) in order to ensure that the concrete fills all of the volume of the enclosure 16 without leaving voids or the like.

Once the concrete has set the top of the construction system 10, as defined by pair of upper faces 30 and the poured concrete therebetween, provides a base on which a conventional wall W may
 10 then be constructed, whether of conventional block work, timber frame, ICF, light gauge steel or the like. The construction system 10 optionally comprises a floor panel 34 again formed of insulation, preferably expanded polystyrene, which is fitted on top of the wall panels 12 on the interior side of the building to form a layer of insulation between the underlying ground and a floor F which may be
 15 of poured concrete or any other suitable construction. The floor panel 34 comprises an upstanding rim 36 in order to both contain the floor F and provide a thermal break between the floor F and the wall W, in addition to enlarging the height of a back wall 38 of the floor panel 34, thereby providing a backing panel or surface with which the block work of the wall W may be aligned in order to ensure a horizontal run for the wall W. Additional insulation panels 40 may be laid beneath the floor panels 34 to provide additional insulation and structural support for the floor F. Again these additional panels
 20 40 are preferably formed from expanded or extruded polystyrene or the like, the density and thickness of which may be chosen to provide desired insulation and structural characteristics.

Although not illustrated, the construction system 10 of the invention is also adapted to provided a supporting functionality to one or more floor components, for example a complete and poured in situ
 25 concrete floor slab or one or more precast slabs or precast floor beams, which may be located between and supported on the horizontal surface of the shoulder formed between the L shaped portion 18 and the upstanding portion 20 of opposed pairs of the construction system 10. For example where the construction system 10 is used to form the foundation and rising wall on at least a pair of opposed walls, the above mentioned shoulder along with the upstanding portion 20 forms
 30 an enclosure within which such floor components may be located and supported. In the case of pouring a concrete floor in situ the underlying surface is in-filled to the level of the above mentioned shoulder, and concrete can then be poured to the required depth within the enclosure defined by the panels 12 which define the perimeter of that space. In the case of using precast concrete floor slabs or beams it may not be necessary to in-fill the enclosure before laying the slabs or beams between
 35 the panels 12.

The outer surfaces of at least the interior facing wall panels 12 may be provided with a damp proof membrane 46 bonded or otherwise affixed thereto, as may the upper surface and upstanding rim 36 of the floor panel 34, which membrane 46 may act as either a damp proof course or a gas
 40 membrane. Doubled sided tape may be fitted at a suitable position on the membrane 46 on either the panels 12 or floor panel 34 in order to allow a conventional damp proof membrane or gas

membrane to be adhered to the respective wall panel 12 or floor panel 34 in a fluid or gas tight manner. Similarly such tape may be fitted along the vertical outer edges of the panels 12 in order to allow a gas tight seal to be formed between longitudinally adjacent panels 12.

- 5 It will therefore be appreciated that the foundation construction system 10 of the present invention allows both a foundation and a rising wall to be formed simultaneously as a monolithic structure which is also encased in thermal insulation and which may also encapsulate additional insulation in the form of the insert 22 to provide a further thermal break against the transfer of heat across the rising wall portion of the system 10. It will be understood that the exact shape and/or dimensions of
- 10 the construction system 10 may be varied to suit particular applications. It will also be appreciated that modifications may be made to the construction system 10 in order to improve the performance thereof. For example keyways may be provided along the inner surfaces of the panels 12 in order to allow the poured concrete to effectively form a mechanical bond with the panels 12 in order to further integrate the concrete and insulation of the panels 12. These keyways may also be used to facilitate
- 15 the installation of additional internal insulation panels having corresponding keys on the edges thereof which may then be slid into position in the keyways which will then retain said panels in position.

- Furthermore the upward height of the upstanding portion 20 and/or the downward height of the lower
- 20 end of the L shaped part 18 of each panel 12 may be increased by suitably securing vertically extending extension panels (not shown) to the upper face 30 of each of the panels 12 which may then be used as shuttering between which additional poured concrete may be introduced to form the walls W of the construction. The upper faces 30 may be provided with castellations (not shown) or other cooperating features which are then also provided on an underside of the extension panels in
- 25 order to allow interlocking of the extension panels and panels 12. Additional fixings may be employed in order to secure the extension panels in position. As with the inner face of the panels 12 the inner face of the extension panels (not shown) may also be provided with slots for receiving an edge of the tie member 16, which slots can then be aligned with the slots in the inner face of the panel 12 to which the extension panel (not shown) is fixed. In this way the slots are aligned and a tie
- 30 member 16 may then be located in the aligned slots overlapping the extension panel and panel 12 such as to provide increases strength at the connection between the extension panel and panel 12.

- The tie members 14 may come in various lengths or widths in order to allow the distance between the opposed panels 12 to be varied as required in order to provide suitable load bearing capacity for
- 35 the over head loads that will be born by the finished construction system 10. For example referring to Figure 4 an alternative form of tie member is illustrated, labelled as 114. The tie member 114 is similar in overall shape to the tie member 14, but is modular in construction and comprises a left hand section 114a, a centre section 114b and a right hand section 114c. The centre section 114b defines a recess 124 for receiving the above described insulation insert 22. Each section 114a,
- 40 114b, 114c incorporates a pair of fasteners which are schematically represented by a hook 114d and a corresponding loop 114e such that the centre section can be fastened to the left and right hand

sections 114a, 114c or the centre section 114b can be omitted and the left and right sections 114a, 114c joined directly together such as to alter the width of the tie member 114. It will also be appreciated that more than one of the centre sections 114b could be employed to further increase the width of the tie member 114. The tie member 114 also includes a central divider 114f which is

5 frangible or otherwise removably fixed across the recess 124 and which may therefore be broken out of the recess 124 in order to allow the insulation insert 22 to be located in the recess 124. The tie member 114 may also have a line of weakness or functional equivalent extending across the width of the panel and as depicted by the line XX in Figure 4. This would allow the tie member 114 to be snapped in half in order to provide half height tie members.

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A further alternative form of tie member is illustrated in Figure 5, labelled as 214. Again in this alternative version like components have been according like reference numerals and unless otherwise stated perform a like function. The tie member comprises a centre section 214b which may be used in isolation to connected opposed panels of the system 10. However the tie member

15 214 additionally comprises one or more side sections 214a which may be joined to either one or both of the left or right hand side of the centre section 214b in order to increase the width of the tie member 214 as required. The tie member 214 comprises a number of fasteners comprising hooks or tabs 214d on the side section 214a and corresponding slots or openings (not shown) in the centre section 214b by which the centre section 214b and side sections 214a may be joined. Any other

20 suitable fasteners may of course be employed.

The tie members 214 also comprises an array of sockets 228 for receiving a reinforcing element such as steel rebar or the like, again preferably extending longitudinally between and supported by adjacent tie members 214. The rebar is preferably secured in position before the concrete is poured

25 into the enclosure around the tie members 214 and will therefore be encased in the concrete at the completion of the construction system 10. The tie member 214 does not include any opening or the like to allow for the introduction of an insulation insert. The tie member 214 may also have a line of weakness or functional equivalent extending across the width of the sections and as depicted by the line XX in Figure 5. This would allow the tie member 214 to be snapped in half in order to provide

30 half height tie members.

The system 10 may be arranged such that the tie members 14; 114; 214 are position only between the upstanding portions 20, only between the L shaped portions 18, or a combination of both. Similarly the insulation inserts 22 may be arranged to be located only between the upstanding

35 portions 20, only between the L shaped portions 18, or a combination of both. In addition the insulation inserts 22 may be arranged to stand proud of the upper face 30. Footings or shoes 42 may be provided to be secured at or adjacent a lower face 44 of each of the panels 12 and to project inwardly into the enclosure 16, or alternatively outwardly away from the enclosure 16 to be suitably covered, for example by infill material. These shoes 42 will then act to resist any upward force on

40 the wall panels 12 as the concrete is poured into the enclosure 16 or are covered by infill if projecting outwardly, ensuring that there is no vertical movement of the panels 12 as the concrete is poured.

Grooves or slots (not shown) may be integrally formed on the inner surfaces of the panels 12 in order to receive a respective end of the tie member 14, 114; 214 thereby allowing the tie members 14, 114; 214 to be removably retained in the panels 12. This allows tie members 14, 114; 214 of different dimensions to be used as required with a standard size panel 12, and additionally allows the construction system 10 to be transported and stored in a deconstructed state in order to significantly reduce the volume thereof. In order to allow fine tuning of the variation in width of the system 10 the slots (not shown) for receiving and anchoring the ends of the tie members 14; 114; 214 may be provided in sets of two or three adjacent slots, each being set deeper into the wall panels 12, for example at depths of 25mm, 50mm and 75mm thereby allow the effective width of the tie members 14; 114; 214 to be varied in 25mm increments, and thus the overall width of the system 10 to be varied in these increments.

As an alternative to partially filling the enclosure 16 before introducing the insulation insert 22, it is also envisaged that the insulation insert 22 may be preinstalled prior to pouring any concrete into the enclosure 16, and may for example be preinstalled through a plurality of the tie members 14, 114; 214 prior to inserting the tie members 14, 114; 214 into the panels 12. In the case of the tie members 114 it is first necessary to remove the central divider 114f. Once the tie members 14, 114; 214 and optionally insulation inserts 22 are fixed in position between the panels 12 the concrete can be poured. In order to avoid the formation of air pockets/cavities within the poured concrete, at least one and preferably both panels 12 incorporate a port 48, shown in Figure 6, which may be closed by a removable plug or insert 50, preferably cut directly from the insulation material of the panel 12. This port 48 may be exposed as the concrete is being poured in order to allow air to escape from the enclosure and thus reduce the likelihood of the formation of cavities, in addition to allowing a vibrating poker to be introduced through the port 48 to effect vibration and compacting of the poured concrete. The port 48 also provides a means of visually inspecting the progress of the poured concrete in filling the enclosure 16. Once the concrete has reached the level of the port 48 the plug 50 can be replaced in order to seal the port 50.

Referring now to Figure 7 there is illustrated a second embodiment of a combined foundation and rising wall construction system, generally indicated as 110, for use in simultaneously forming a thermally insulated monolithic foundation and rising wall of a building or similar construction combining a poured concrete structure enclosed in insulation which acts both as shuttering for the poured concrete and permanent insulation surrounding the concrete. In this second embodiment like components have been accorded like reference numerals and unless otherwise stated perform a like function.

The construction system 110 again comprises a pair of panels 112 which have a stepped or substantially Z shaped profile or cross section and which in use are secured in spaced relationship to one another by an array of tie members (not shown) extending between the panels 112 as hereinbefore described and shown with respect to the first embodiment, such as to define an enclosure 116 therebetween. Each panel 112 comprises a substantially L shaped portion 118

defining the foundation or lower part of the enclosure 116 and an upstanding portion 120 extending substantially vertically upwardly from the L shaped portion 118 and which in use defines the rising wall portion of the enclosure 116. However unlike the first embodiment each panel 112 additionally comprises an upright wall 60 in parallel spaced relationship to the upstanding portion 120 such as to
 5 define a channel 62 therebetween. The upright wall 60 is again formed from an insulating material, for example expanded or extruded polystyrene, and is preferably formed integrally with the L shaped portion 118 such as to establish a cross section substantially resembling a figure four. In the embodiment illustrated the upstanding portion 120 is of a greater height than the upright wall 60 although it will be appreciated that this need not be the case, and the two could be of approximately
 10 the same height. The upright wall 60 is preferably substantially coplanar with the outer vertical part of the L shaped portion 118 although it will be appreciated that the upright wall 60 could be positioned inboard of the position illustrated.

The panels 112 may be provided with one or more ports or openings (not shown) providing
 15 communication between the channel 62 and the enclosure 116, similar to the port 48 of the panel 12 and allowing the same functionality in terms of inspection, venting of air and vibration of the concrete in the main enclosure 116. The ports or openings may be circular, elongate or any other suitable shape, and may include a plug to seal the port. Providing an elongate or enlarged port in the panel 112 will also allow a substantial and therefore load transferring connection between the concrete in
 20 the enclosure 116 and the concrete in the channel 62 in order to structurally fix the concrete in the channel 62 to the concrete in the enclosure 116. These ports or openings (not shown) may also be used to position rebar (not shown) or other steel or similar reinforcing elements, preferably vertically, between the enclosure 116 and the channel 62, which will then ultimately be encased in concrete.

25 In use, once concrete has been poured to fill the enclosure 116 concrete is then poured into each channel 62, preferably to completely fill the channel 62 such that the poured concrete is substantially flush with an upper edge of the upright wall 60. In this way, once the concrete has set, the upper surface of the concrete in the channel 62 provides a broad footing onto which various components may be supported. In the embodiment illustrated that portion of the interior facing panel 112
 30 provides an indirect footing to support one edge of a precast floor slab P, on which sits a layer of insulation I which is then preferably covered with a layer of screed C or functionally equivalent finish. The exterior facing panel 112 provides a footing to support an external single brick leaf wall L that is tied to a conventional light gauge steel wall S which is bolted to and supported on the pair of upstanding portions 120. It will of course be understood that any other form of wall construction may
 35 be used, and the leaf wall L and steel gauge wall S are exemplary only. A layer of insulation B, such as polyisocyanurate, and located in the cavity formed between the outer leaf L and the inner steel wall S preferably stands in direct contact with the upper face of the upstanding portion 120 of the panel 112, thereby forming a continuous run of insulation from above to below ground, significantly reducing thermal leakage from the interior to the exterior. In addition the layer of insulation I above
 40 the floor panel P is in abutting contact with the upright portion 120 of the inner panel 112, providing a further barrier to thermal leakage at the interface between the floor and the wall of the building in

question. This arrangement may be mirrored on the opposite panel 112 where the system 110 is used as the foundation of a party wall between adjacent and connected buildings or rooms.

Referring now to Figure 8 there is illustrated a third embodiment of a combined foundation and rising wall construction system, generally indicated as 210, for use in simultaneously forming a thermally insulated monolithic foundation and rising wall of a building or similar construction combining a poured concrete structure enclosed in insulation which acts both as shuttering for the poured concrete and permanent insulation surrounding the concrete. In this second embodiment like components have been accorded like reference numerals and unless otherwise stated perform a like function.

The construction system 210 again comprises a pair of panels, one of the panels 112 from the second embodiment forming the outwardly or exterior facing side of the system 210 and one of the panels 12 from the first embodiment forming the inwardly facing side of the system 210. As mentioned with reference to the second embodiment, the panel 112 includes an upright wall 60 defining a channel 62 to be filled with poured concrete, but in the third embodiment the upright wall 60 is the same height as the upstanding portion 120. The concrete filled channel 62 again provides a footing for a brick leaf L which is tied to a conventional light gauge steel wall S which is bolted to and supported on a precast floor slab P an edge of which overlies and is supported by the rising wall portion of the combined foundation and rising wall formed by the two panels 12; 112. A layer of insulation I is located above the floor slab B and is then preferably covered with a layer of screed C or functionally equivalent finish. The insulation abuts against the steel wall S, or a layer of plasterboard or other covering provided on the wall S. A layer of insulation B, such as polyisocyanurate, located in the cavity formed between the outer leaf L and the inner steel wall S preferably stands in direct contact with the upper face of the upstanding portion 120 of the panel 112, thereby forming a continuous run of insulation from above to below ground, significantly reducing thermal leakage from the interior to the exterior. The floor slab B abuts against the insulation B while the layer of floor insulation I abuts against the plasterboard or insulation covered steel wall S in order to further reduce thermal leakage at the interface between the floor and wall of the building. The use of the steel wall S is an exemplary and any other wall construction may be employed above the system 210. The floor arrangement may be mirror on the opposed panel 112 should the system 210 be used to form the foundation of a so called party wall.

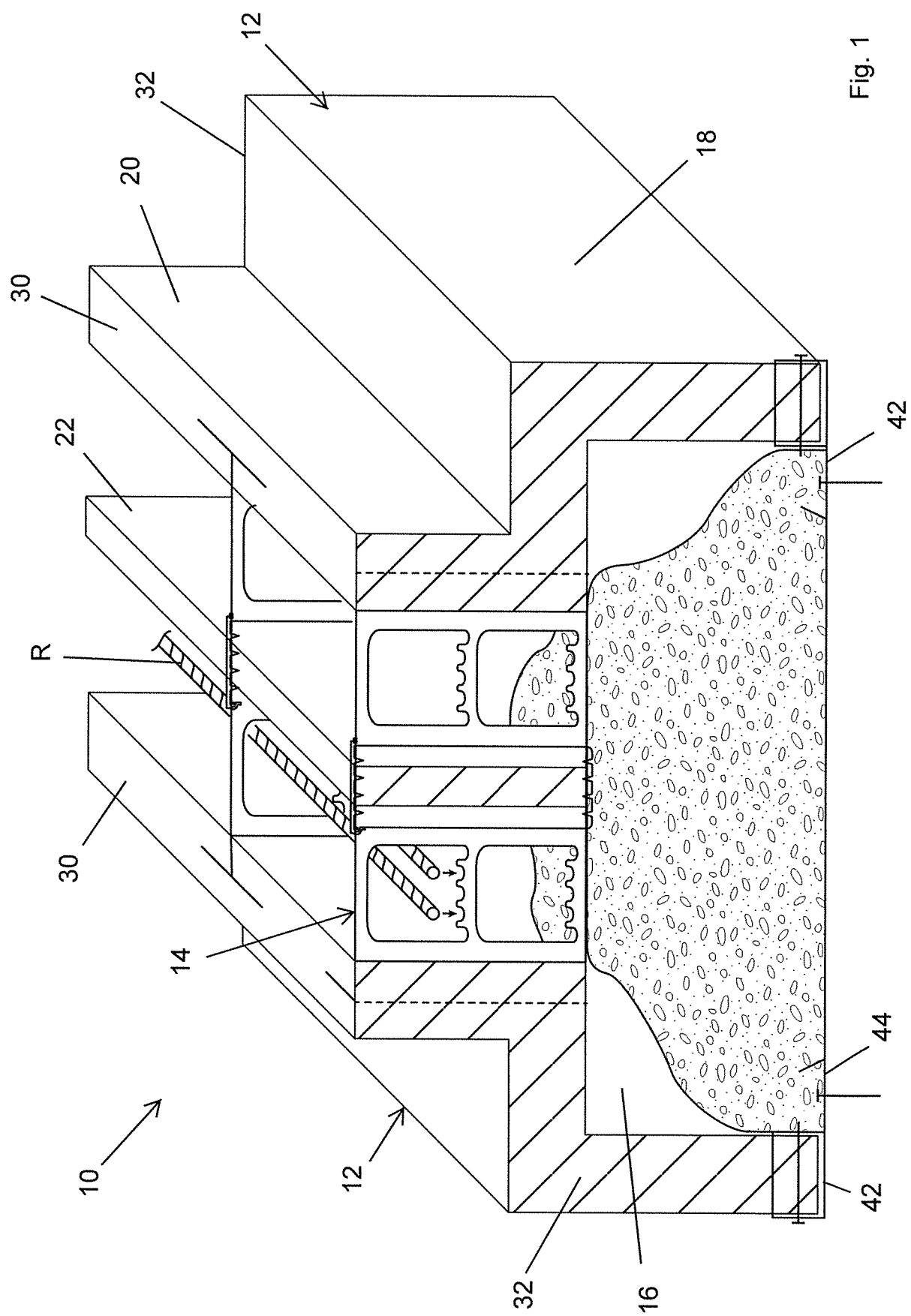
In any of the embodiments described above one or more parts of the panel 12; 112 may be releasably mounted to the remainder of the panel 12; 112, for example the upright wall 60 of the panel 112 may be removable from the remainder of the panel 112, which would be beneficial for the transportation and storage of the panel 112, as the remaining Z shape enables multiples of the panel 112 to mesh together when stacked with one another. Such a removable portion may be provided with any suitable coupling (not shown) to facilitate the releasable mounting, and for example a tongue and groove type of interlocking coupling may be provided allowing a tongue or similarly shaped end of the upright wall 60 to be slid into a corresponding groove or slot formed in the

outer face of the horizontal part of the panel 112, thus interlocking the upright wall 60 to the remainder of the panel 112. The same arrangement may be employed for any other part of the panel 12; 112.

- 5 It will thus be appreciated that the foundation construction system 10; 110; 210 of the present invention enables a foundation and rising wall to be formed in a single operation and thus as a monolithic structure, as opposed to the conventional two or three step process of pouring a concrete foundation and once set building a block work rising wall up to floor level. In addition the panels 12; 112 act as shuttering for the poured concrete during the construction phase and then as insulation
- 10 for the finished product, which may also incorporate optional reinforcing and insulating elements encased therein. This insulation can provided protection to the poured concrete against aggressive or otherwise detrimental environmental conditions such as soils types that are corrosive to concrete or significant temperature fluctuations which can damage bare concrete.
- 15 The invention is not limited to the embodiment described herein but can be amended or modified without departing from the scope of the present invention.

Claims

1. A combined foundation and rising wall construction system comprising a pair of opposed stepped insulating panels; and a plurality of tie members securing the panels in spaced relationship to one another such that concrete may be poured into an enclosure defined between the panels to create an insulated monolithic foundation and rising wall.
2. A combined foundation and rising wall construction system according to claim 1 in which each panel has a substantially Z shaped cross section.
3. A combined foundation and rising wall construction system according to claim 1 or 2 in which each panel comprises an L shaped portion defining the foundation and an upstanding portion extending from the L shaped portion and defining the rising wall.
4. A combined foundation and rising wall construction system according to any preceding claim comprising an insulation insert locatable in the enclosure between and parallel to the pair of panels.
5. A method of constructing a monolithic foundation and rising wall, the method comprising securing a pair of stepped insulation panels in spaced relationship to one another; locating the pair of panels on a surface so as to define an enclosure; and pouring concrete into the enclosure to form the monolithic foundation and rising wall.



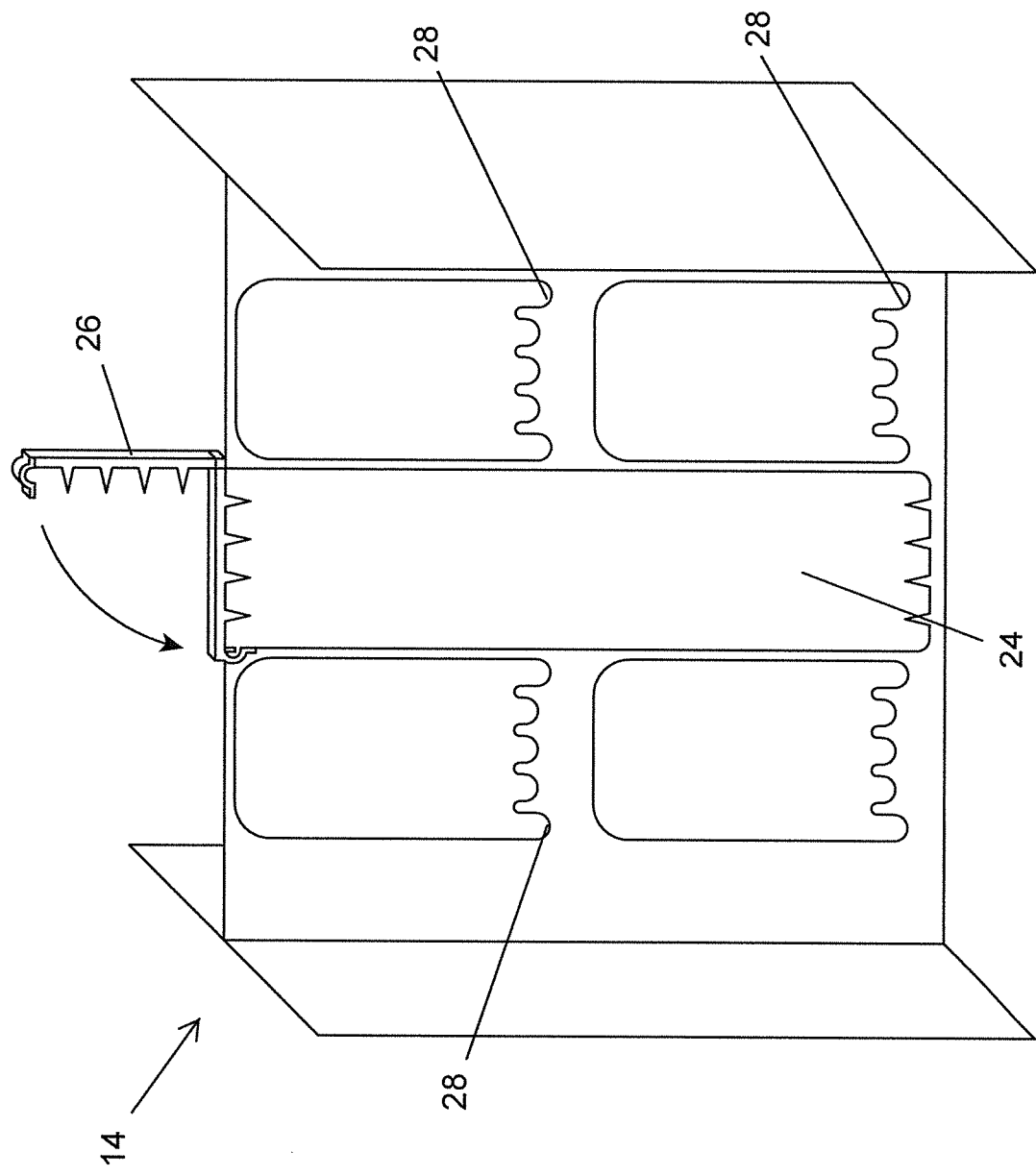


Fig. 2

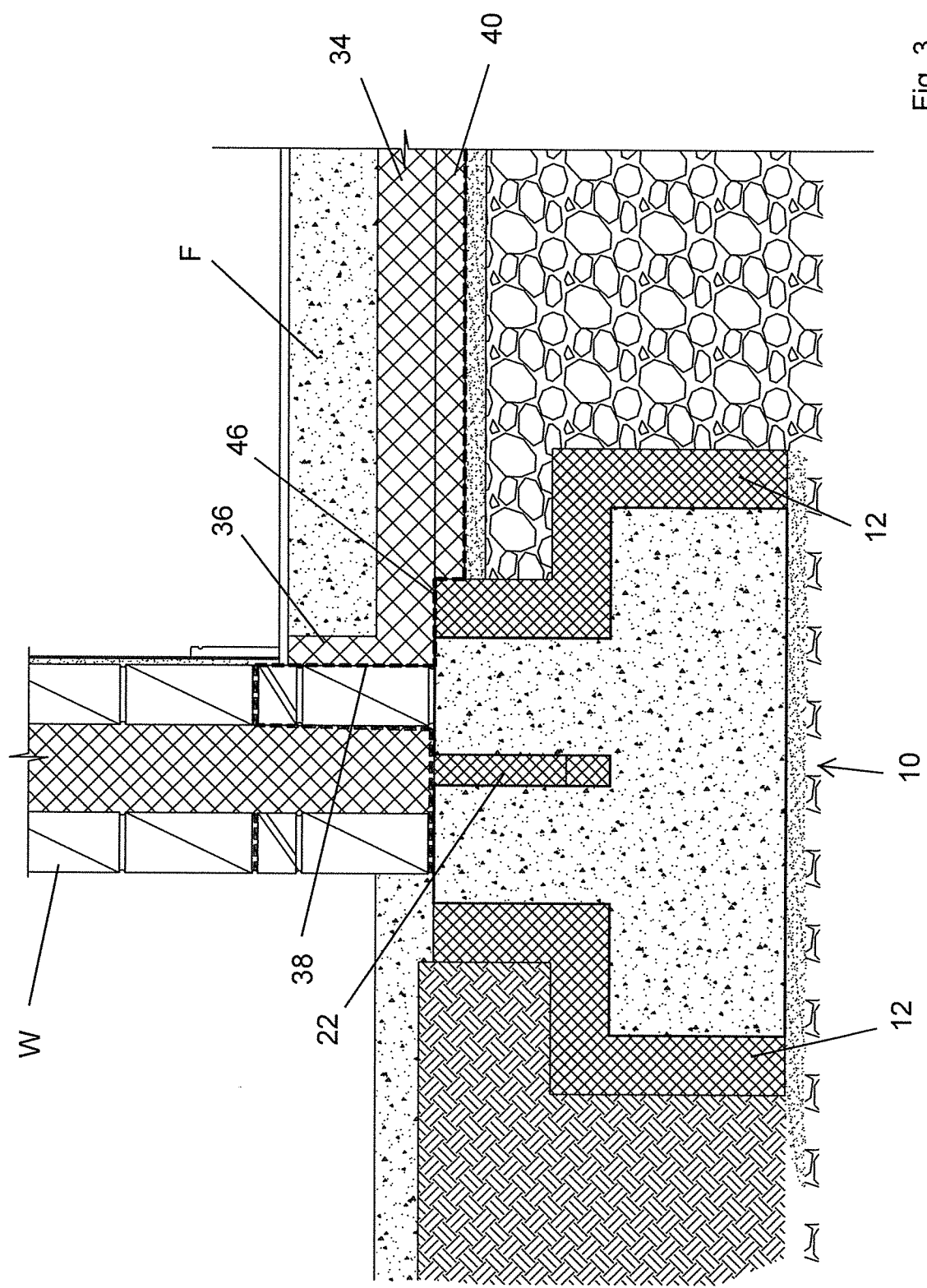


Fig. 3

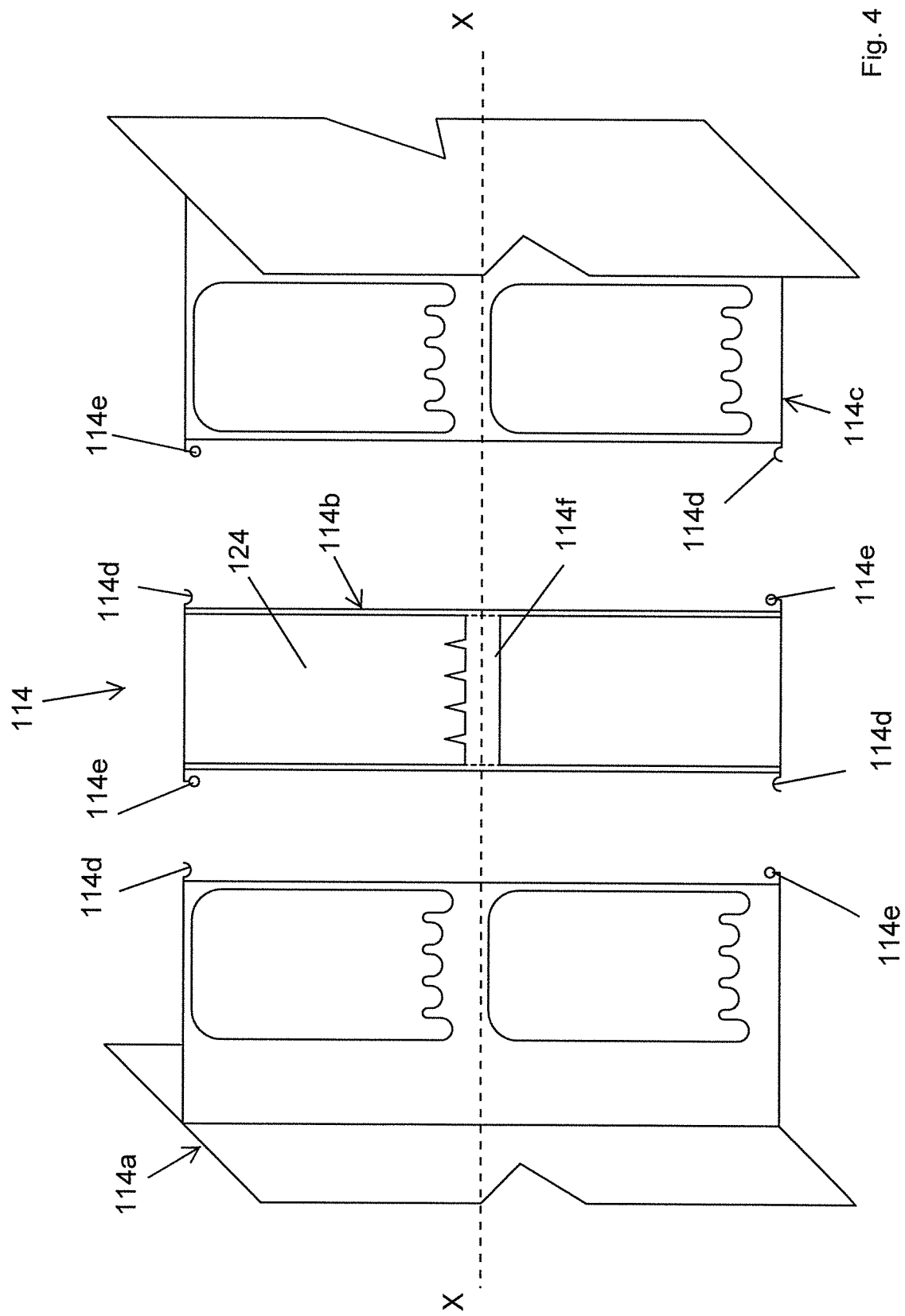


Fig. 4

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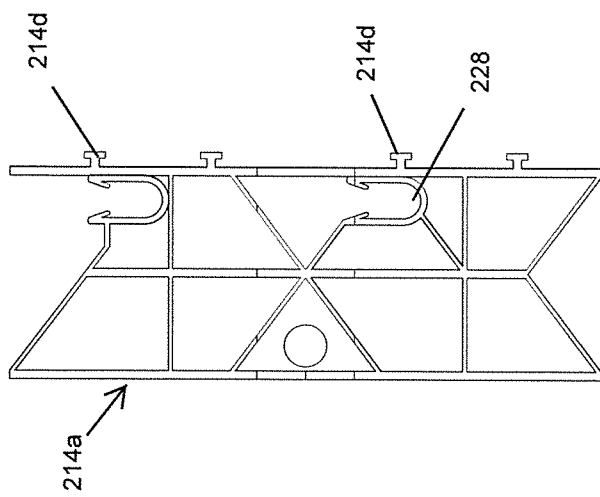
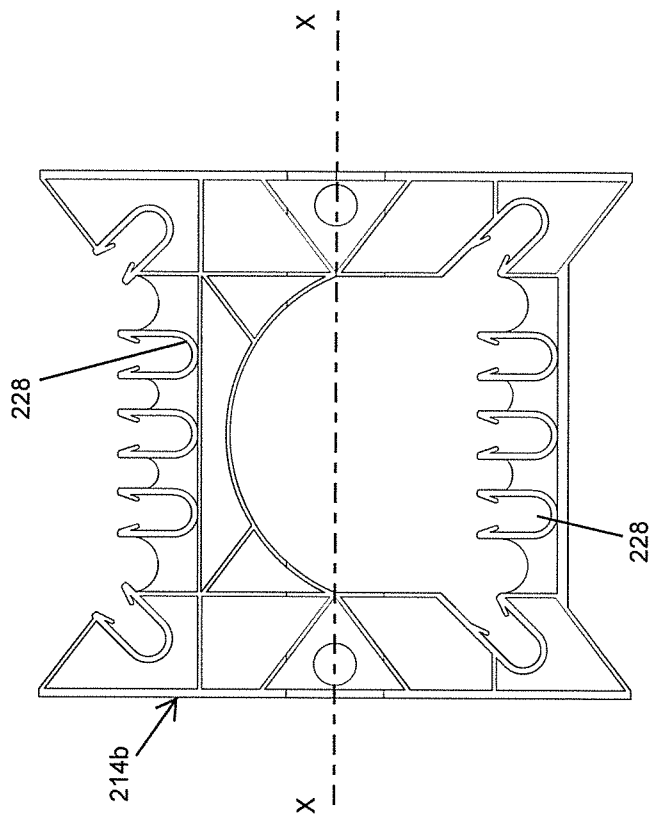


Fig. 5

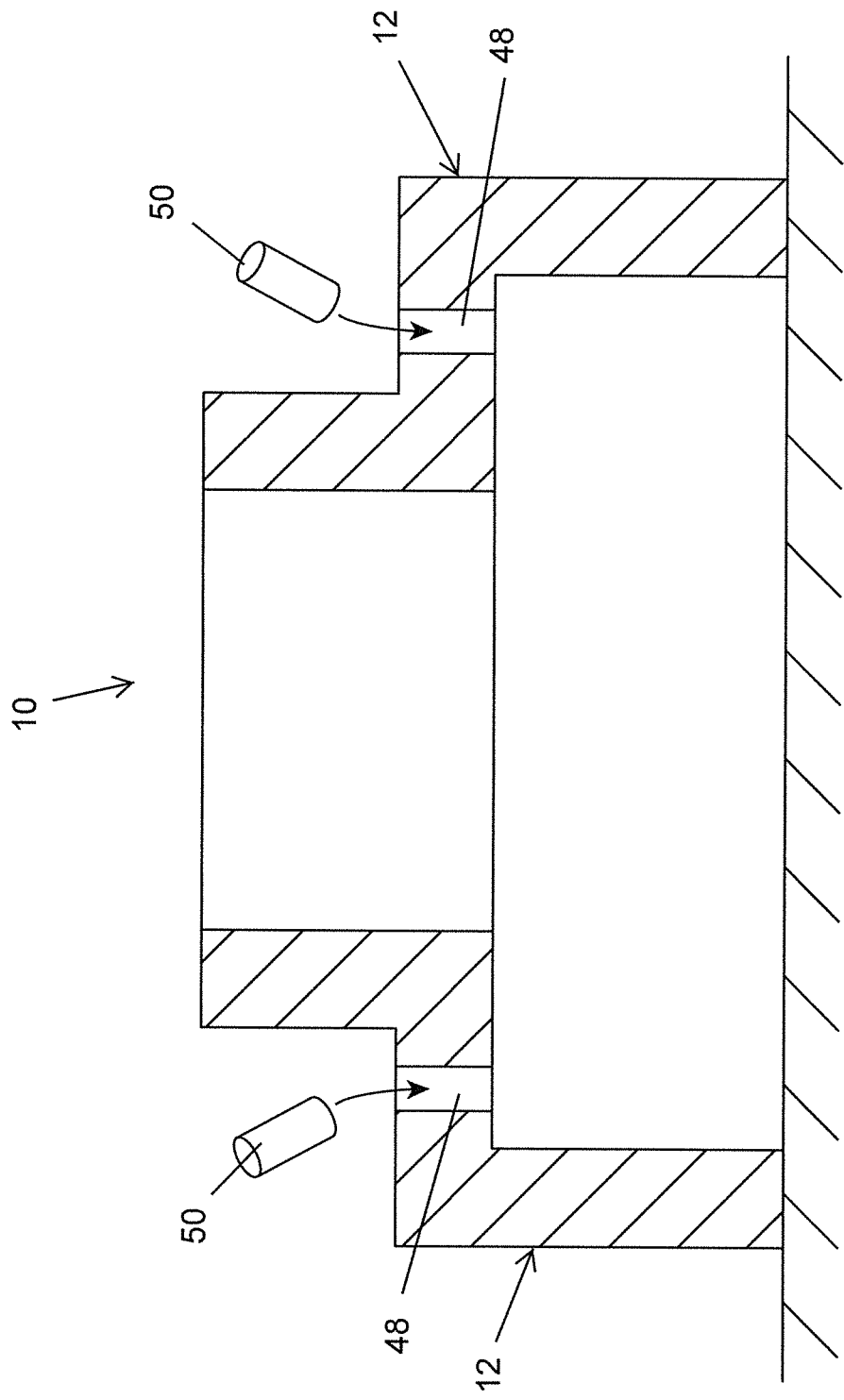


Fig. 6

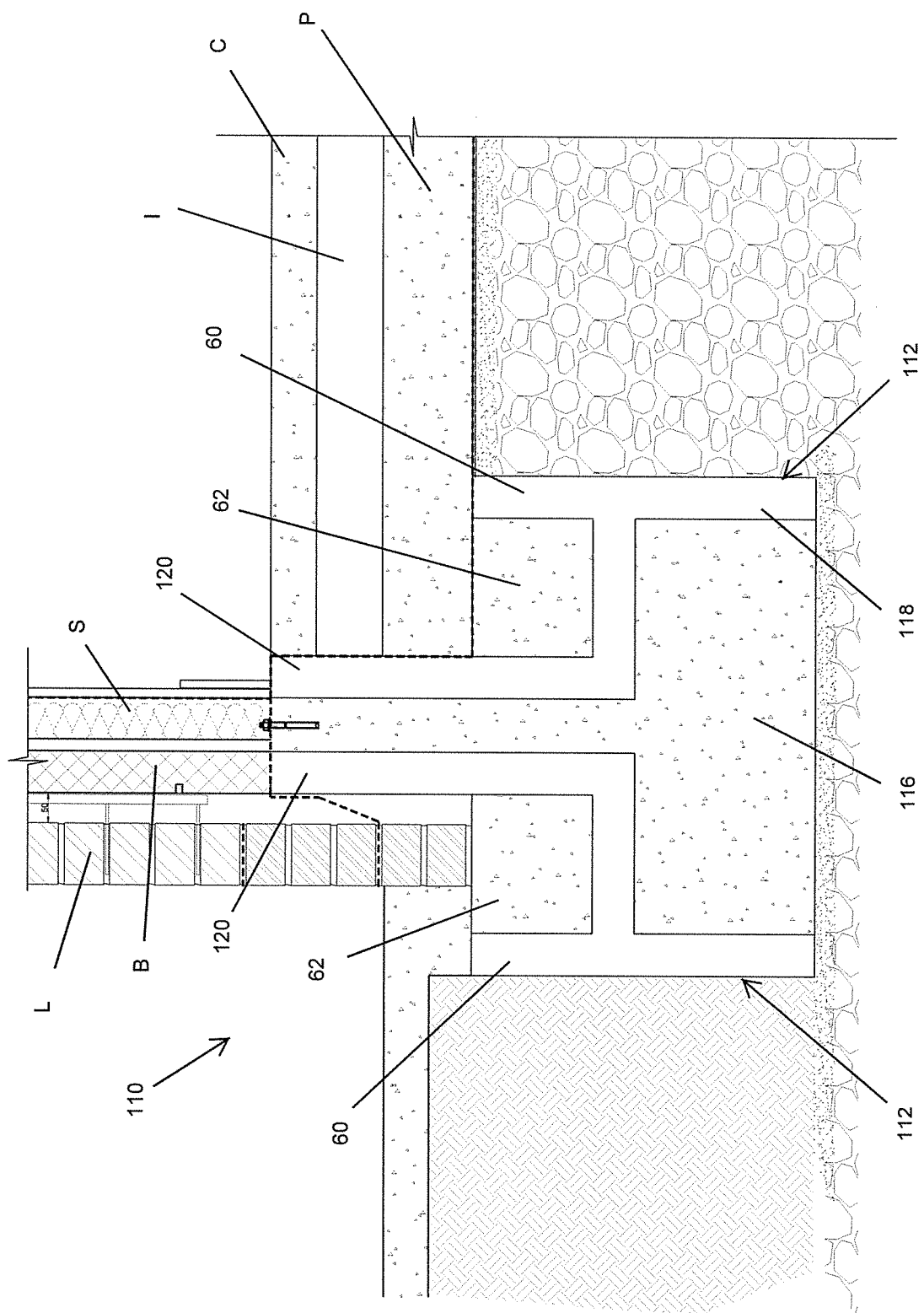


Fig. 7

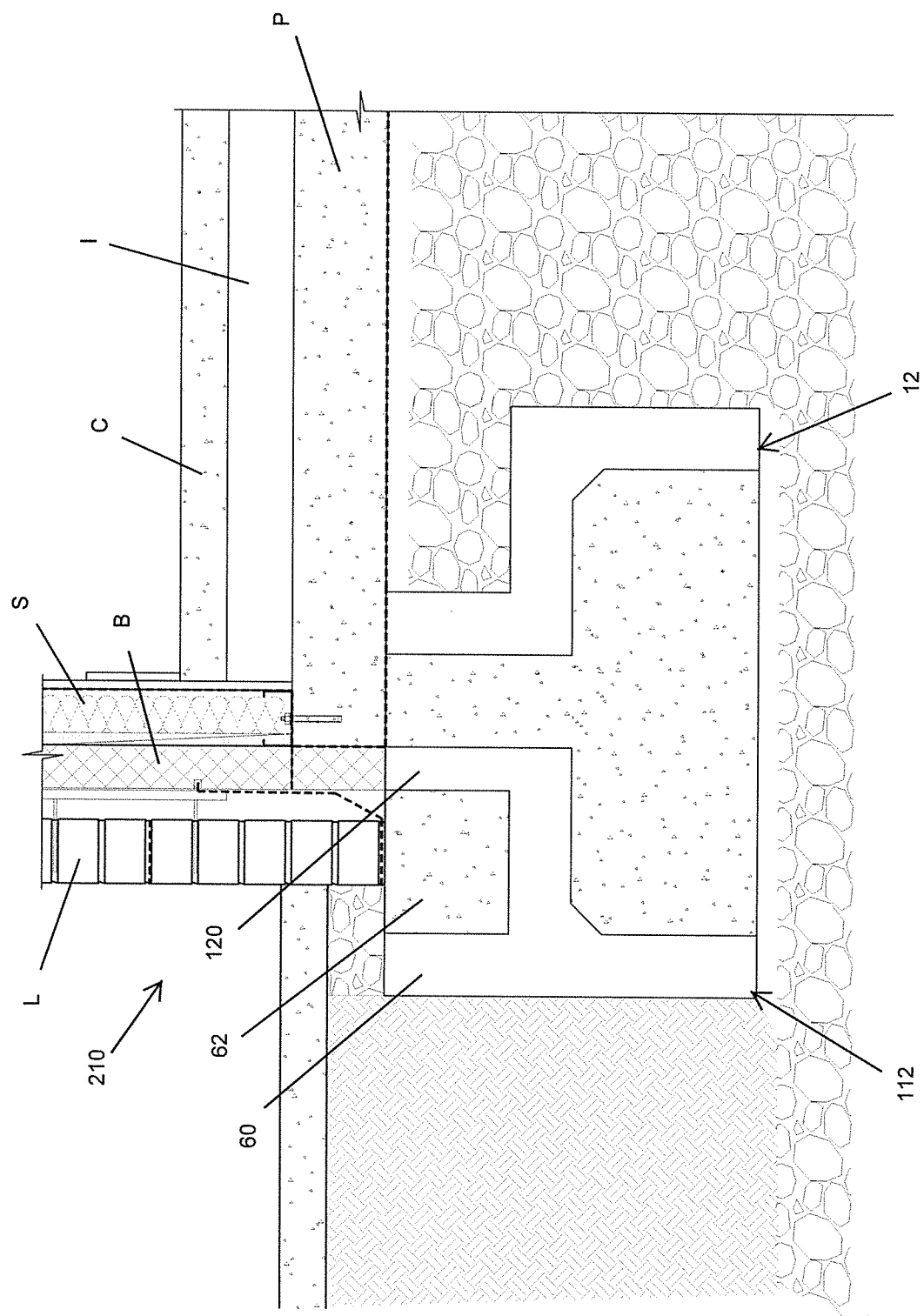


Fig. 8