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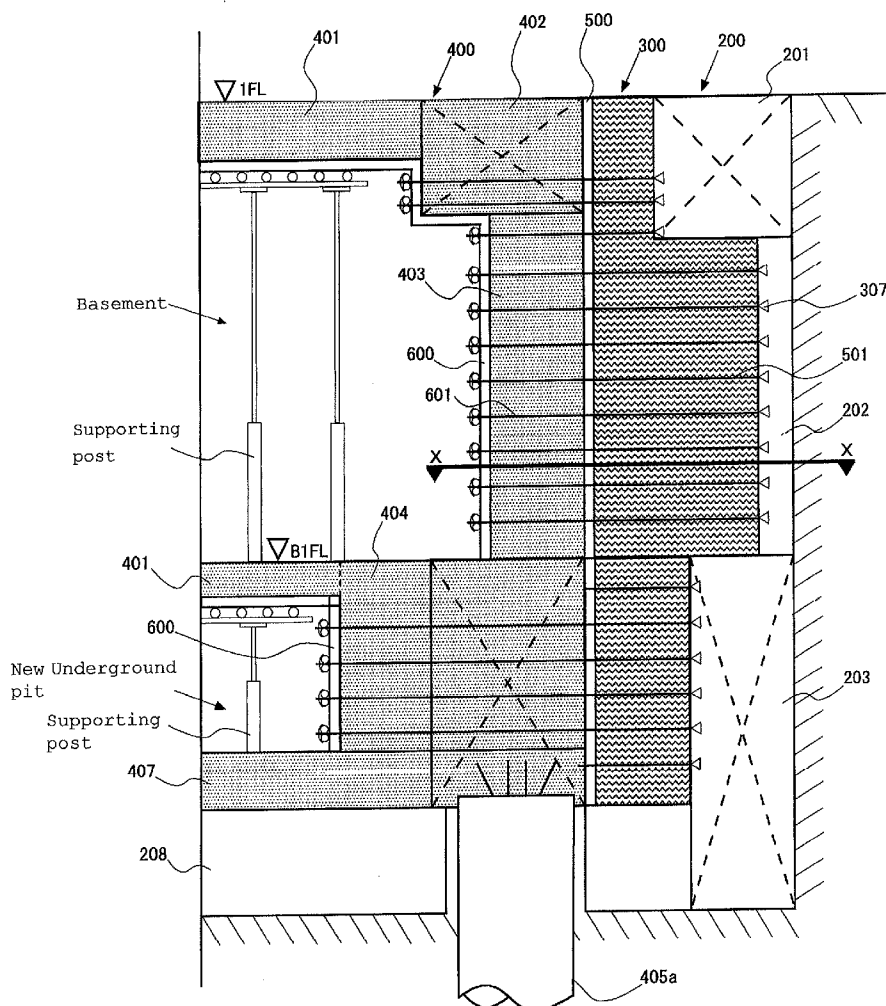


Fig.1

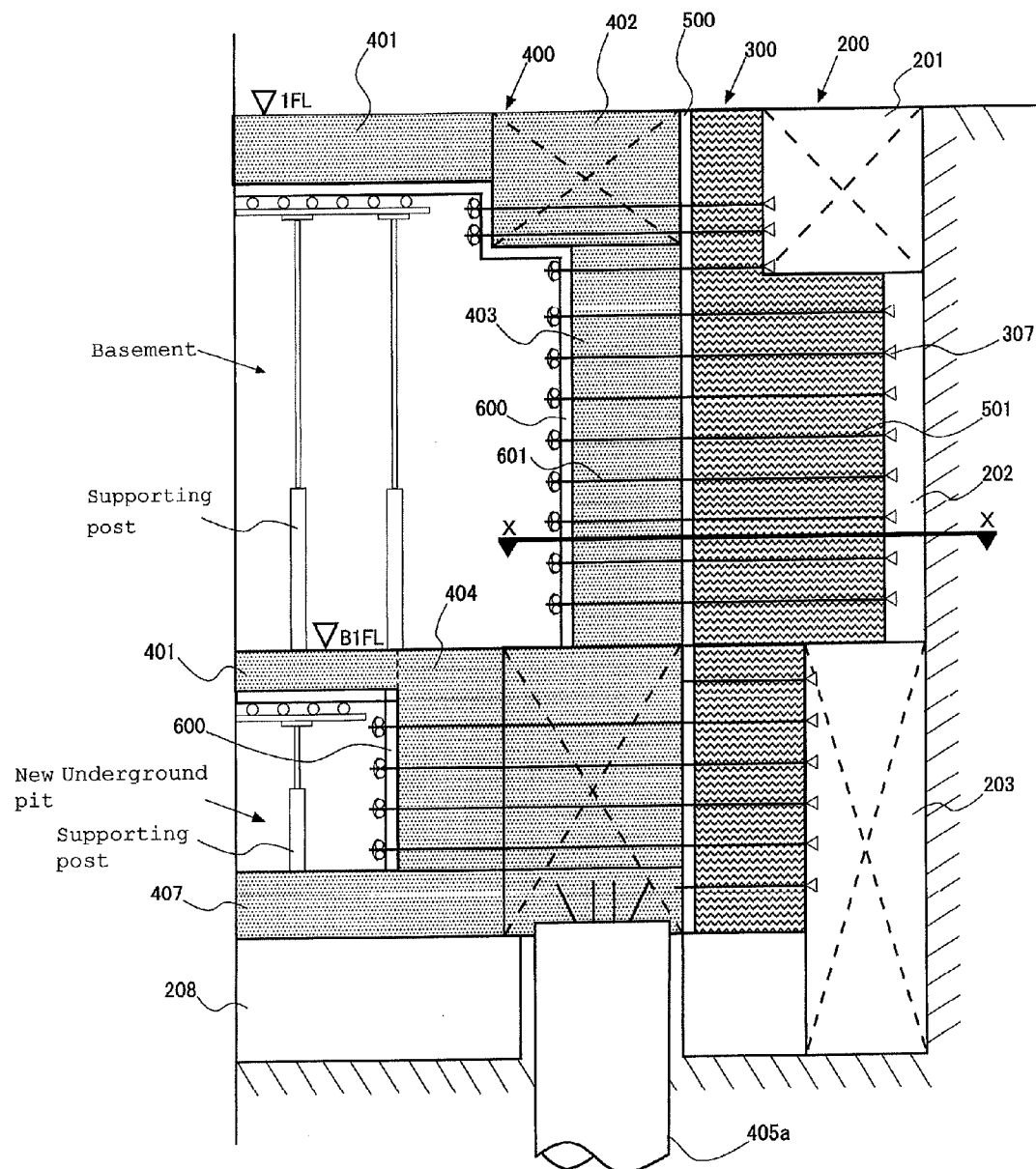


Fig.2

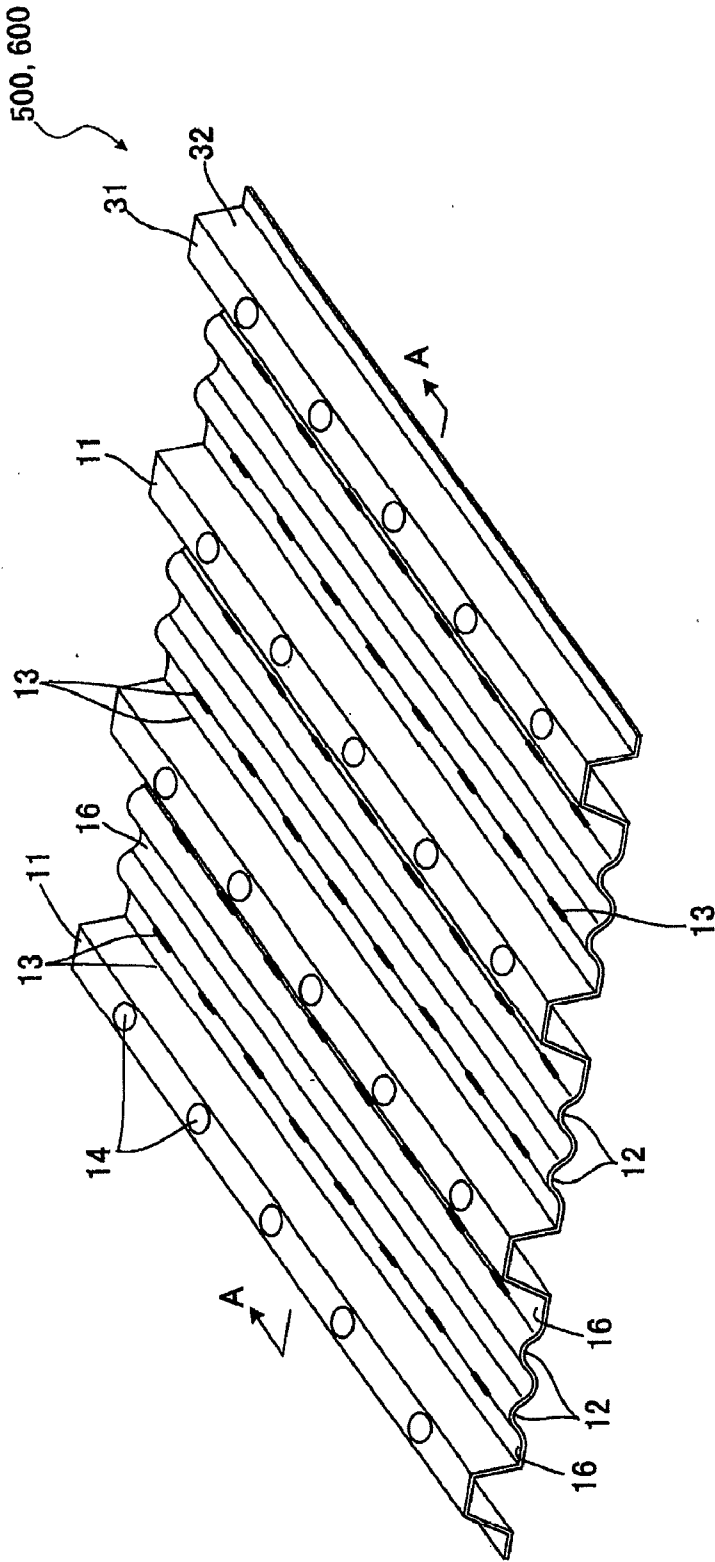


Fig. 3

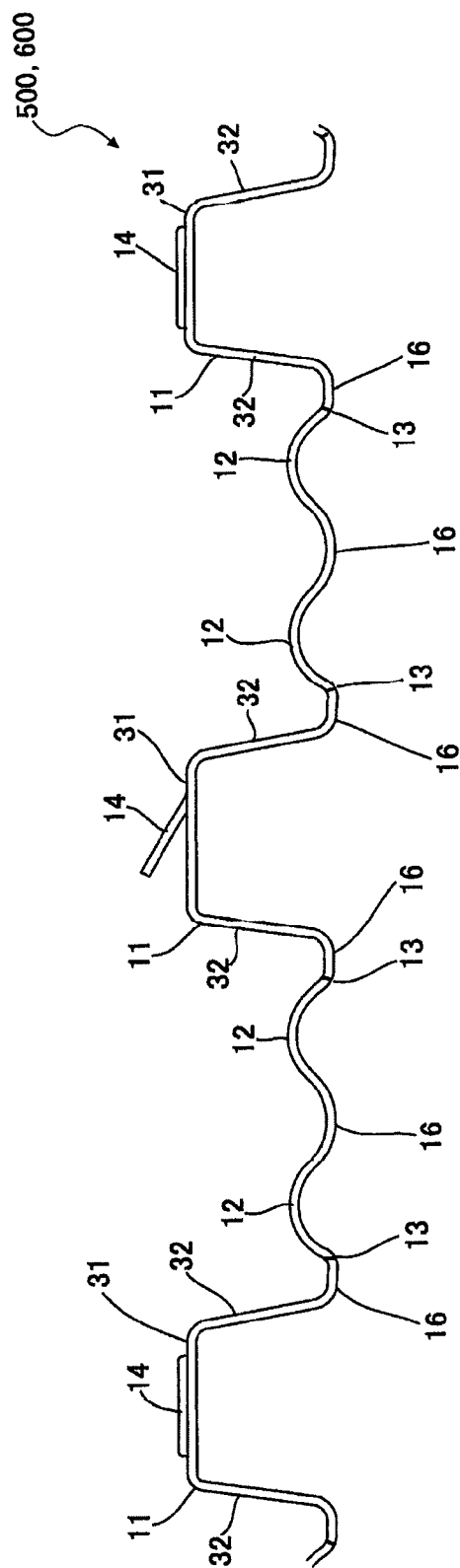


Fig. 4

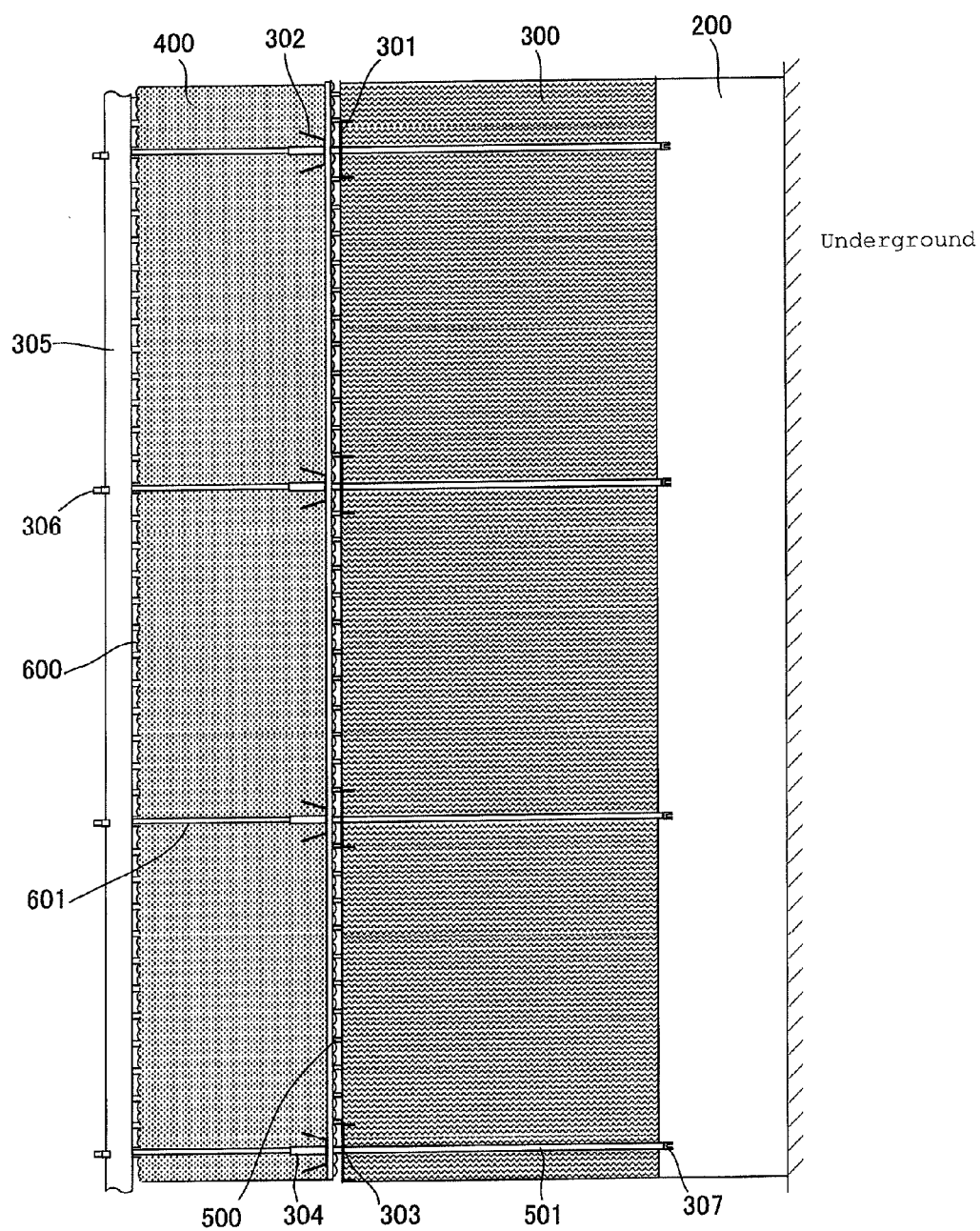
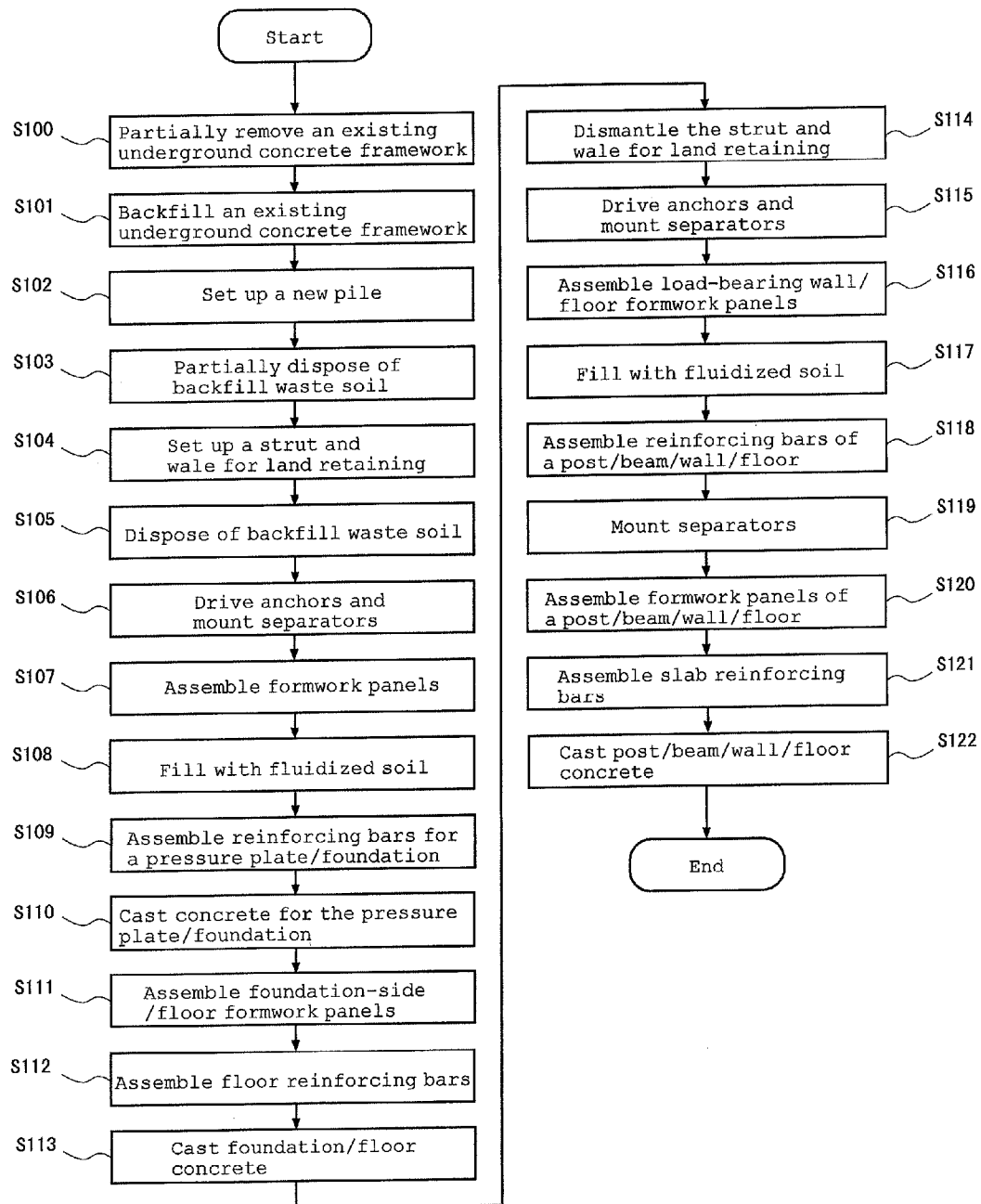


Fig. 5



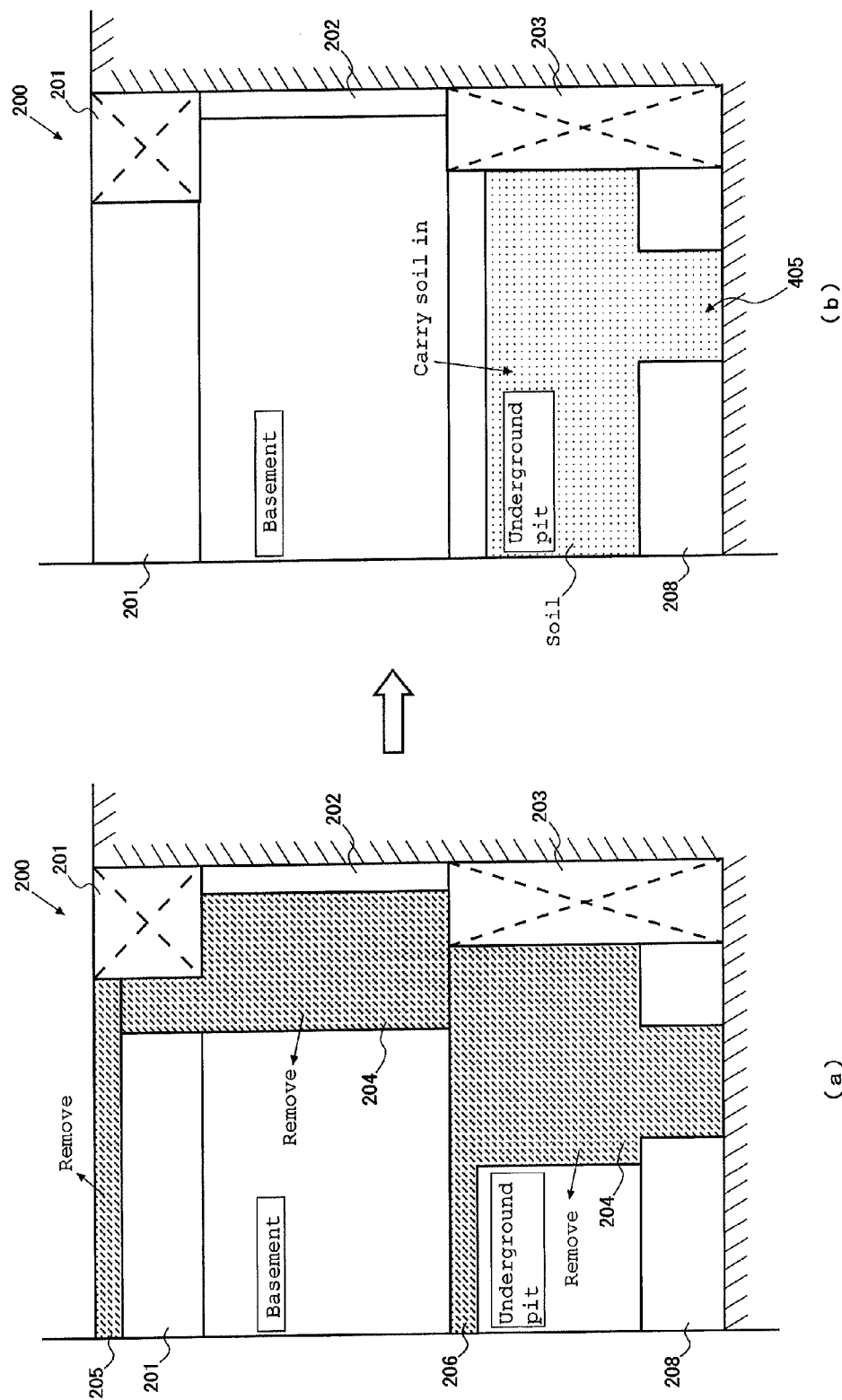
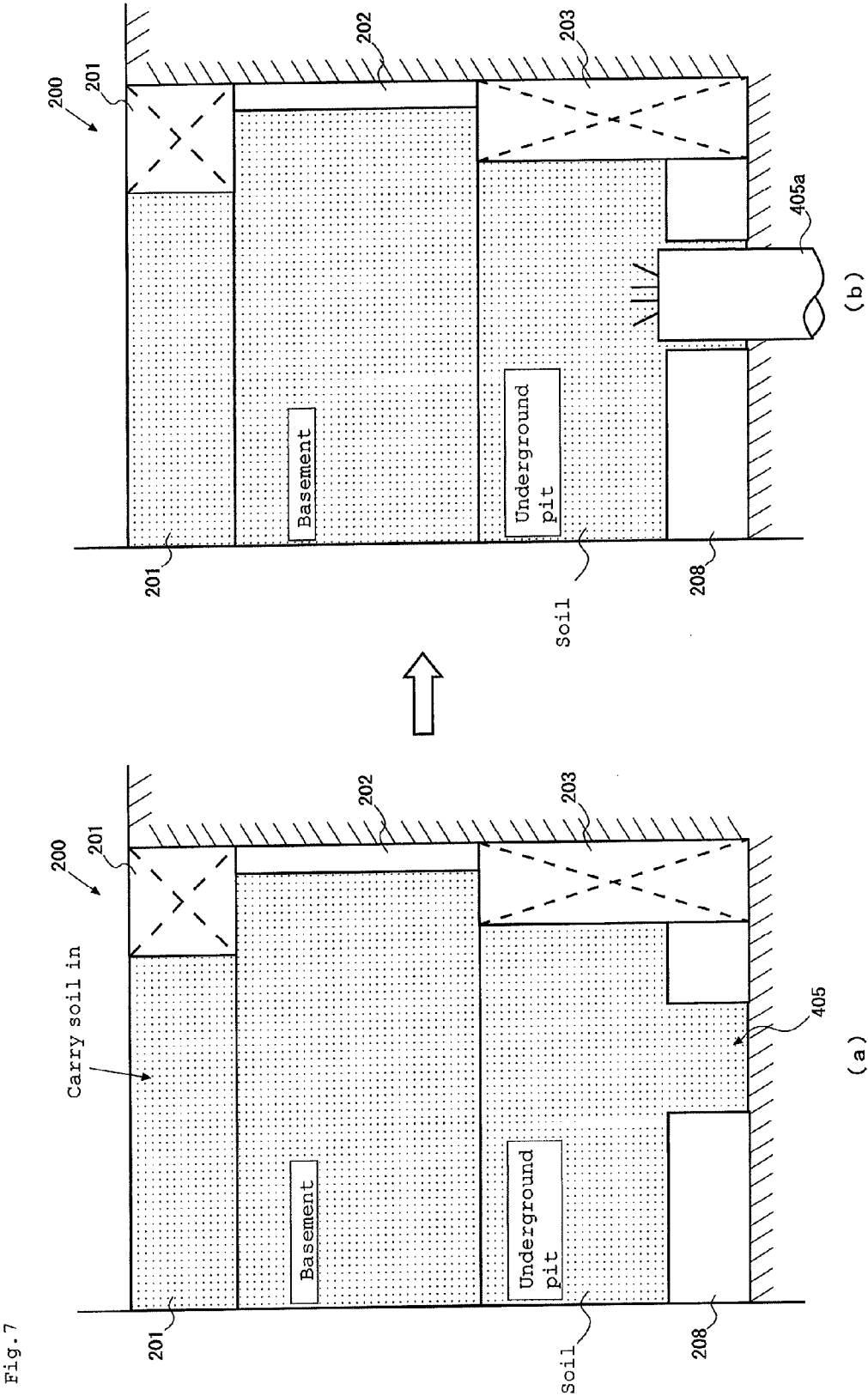


Fig. 6



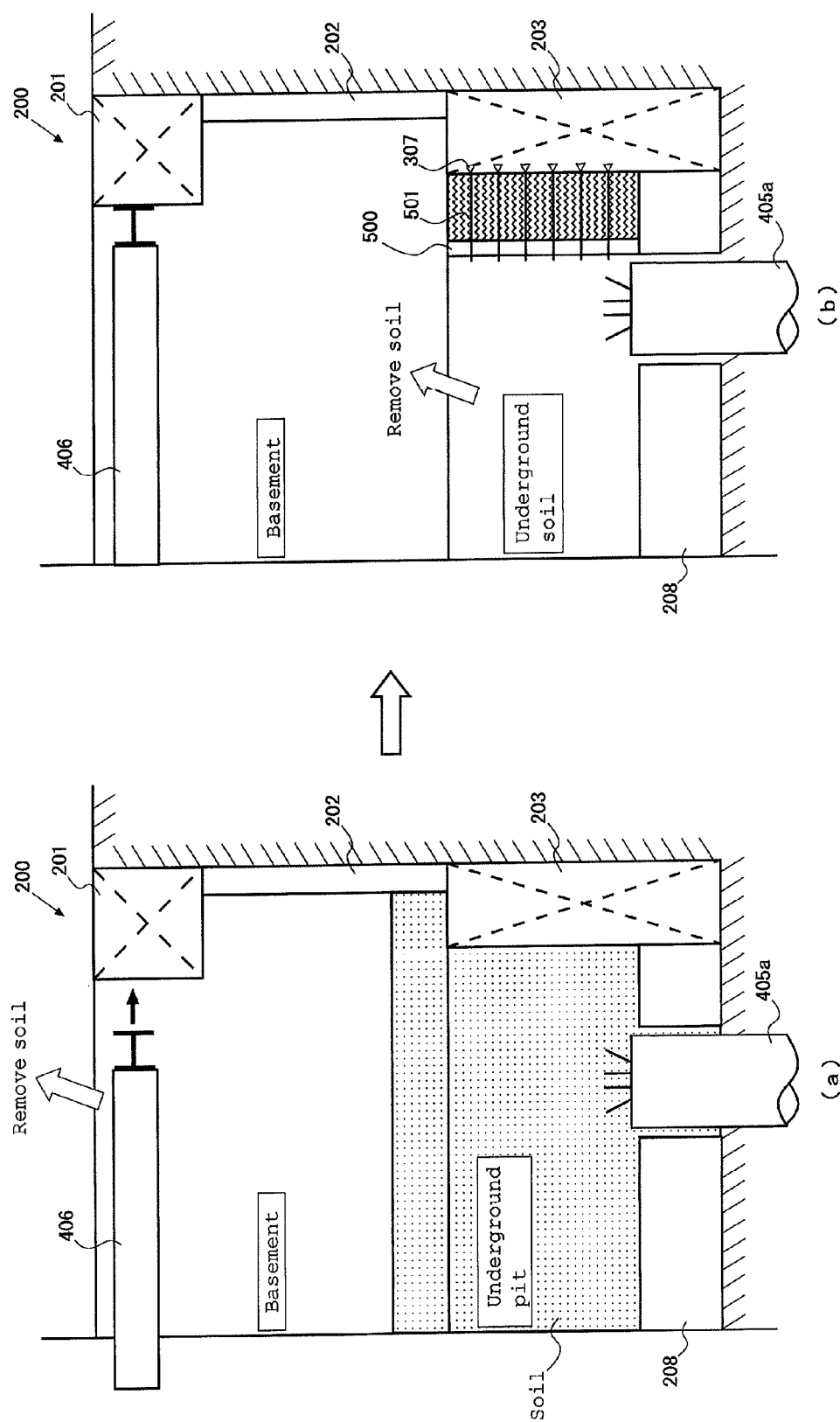
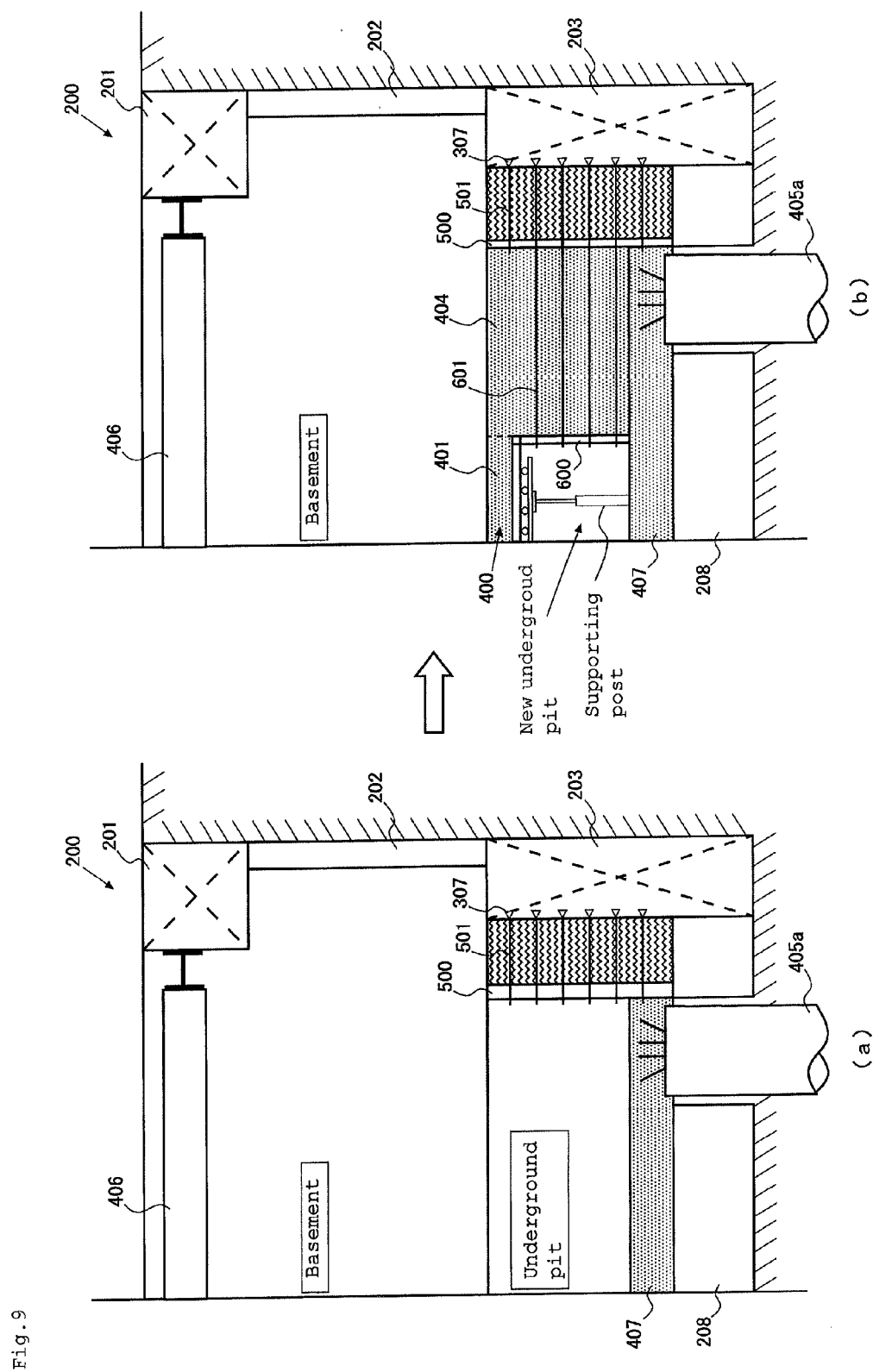


Fig. 8



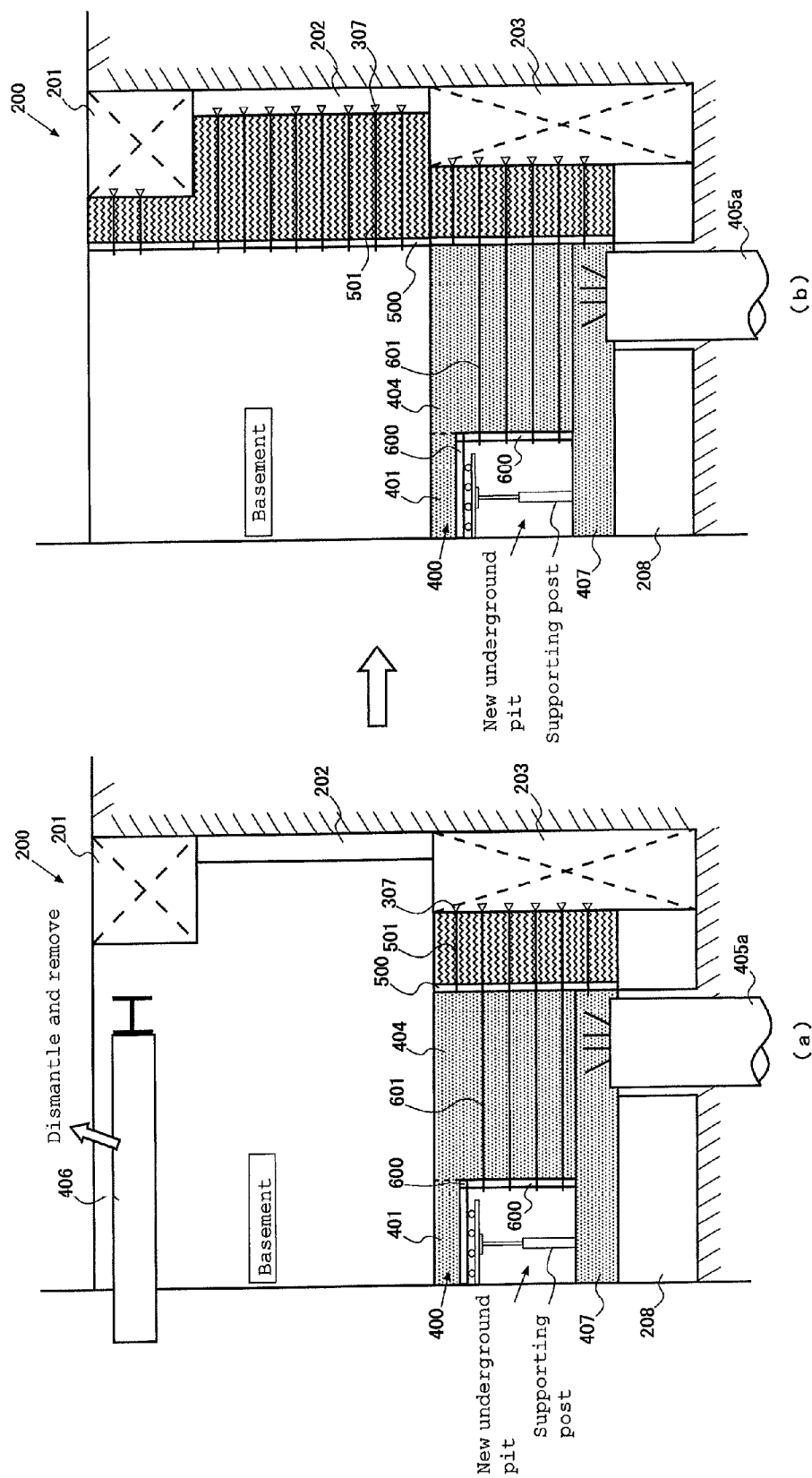
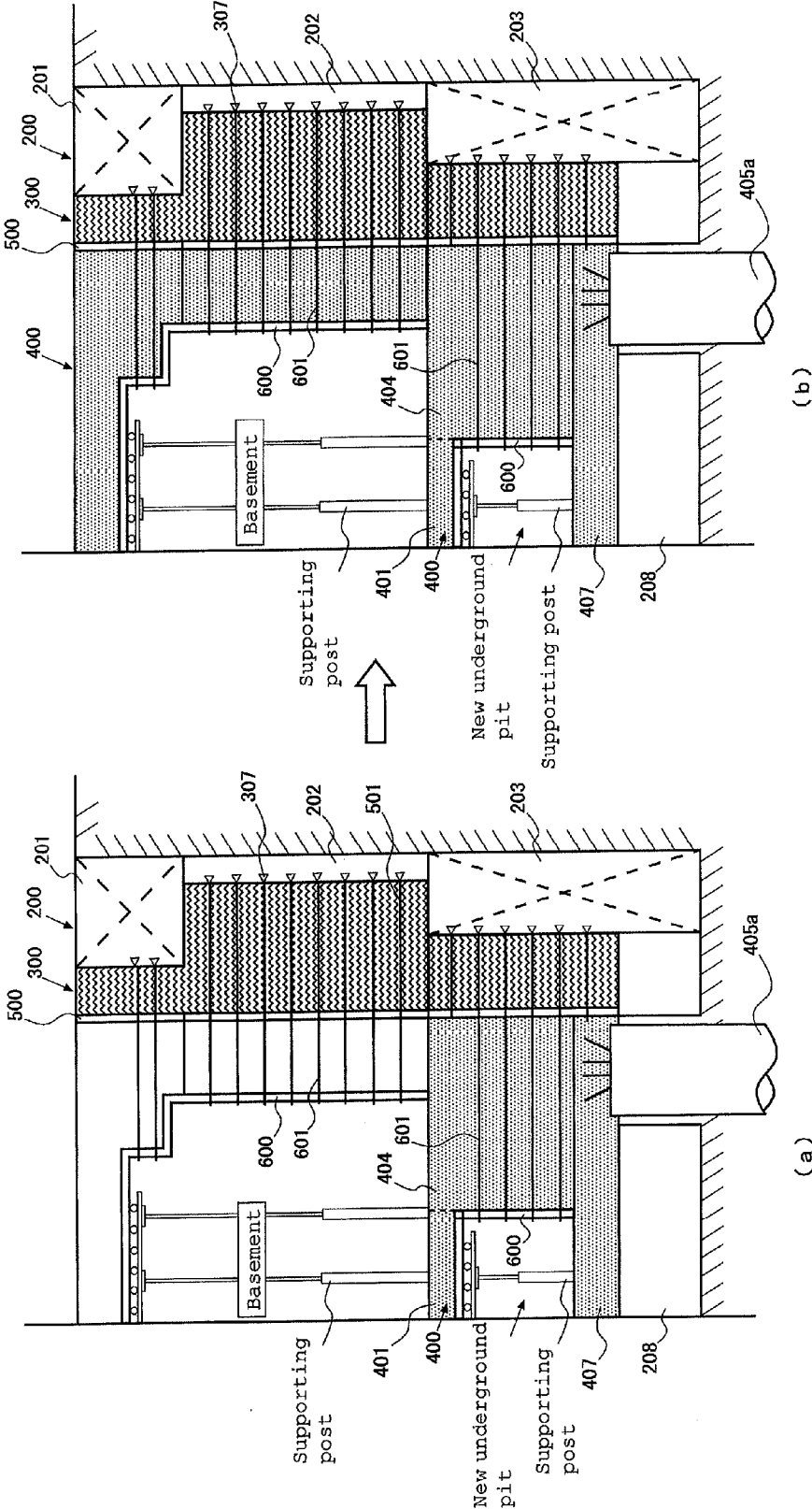


Fig.11



CONSTRUCTION METHOD FOR NEW UNDERGROUND STRUCTURE

TECHNICAL FIELD

[0001] The present invention relates to a construction method for a new underground structure, and in particular to a construction method for a new underground structure by which a reduction in the load imposition of the new underground structure on an existing underground structure and a reduction in construction cost can be achieved.

BACKGROUND ART

[0002] When various structures, such as a building, are rebuilt, an existing structure is required to be dismantled, but, when the existing structure is equipped with an underground structure, such as a basement floor, the existing underground structure is also required to be dismantled. However, an underground exterior wall, a post, an underground beam, a foundation, and the like which constitute the existing underground structure bear soil pressure from surrounding soil, and therefore haphazard dismantlement may cause ground collapse, ground displacement, or the like, resulting in a considerable influence on neighboring areas.

[0003] Then, a method for newly building an underground structure without dismantling an existing underground structure is suggested in a patent document 1.

[0004] According to the construction method for an underground structure suggested in the patent document 1, first, a strut is set up to a floor-height middle portion of an existing underground exterior wall of the first basement floor, and floor beams are removed while pressure is applied to the strut in the direction of the exterior wall via a jack. This series of operations are performed on each floor, a new wall is placed within the existing underground exterior wall so as to construct a combined wall with the existing underground exterior wall, and then the floor beams are removed. This series of operations are performed on each floor so that a new underground structure is constructed.

[0005] Patent Document 1: Japanese Patent Application Laid-open Publication No. 2005-201007

SUMMARY OF THE INVENTION

Problem to Be Solved by the Invention

[0006] According to the construction method for an underground structure disclosed in the patent document 1, however, since the combined wall to be constructed is for integrating the existing underground exterior wall and a new wall with each other, the load imposition acting downstairs increases. Therefore, a larger supporting force is required to support this load, which causes the problem of increasing construction cost.

[0007] The present invention has been made in view of these circumstances, and an object thereof is to provide a construction method for a new underground structure, which can achieve reduction in the load imposition of a new underground concrete framework on an existing underground concrete framework, and reduction in construction cost for building the new underground concrete framework.

Means for Solving the Problem

[0008] In order to achieve the above object, the present invention provides a construction method for a new under-

ground structure by which a new underground concrete framework is constructed without entirely dismantling an existing underground concrete framework, wherein: a fluidized soil wall is constructed by filling an inner circumferential face of the existing underground concrete framework with fluidized soil, and a new underground concrete framework is constructed on the inner circumferential face of the fluidized soil wall.

[0009] Further, in order to achieve the above object, the present invention provides a construction method for a new underground structure by which an existing underground concrete framework is partially utilized to construct a new underground concrete framework without entirely dismantling and removing the existing underground concrete framework, the method including: vertically providing a first formwork body on an inner circumferential face of the existing underground concrete framework at a predetermined distance from the existing underground concrete framework; filling a space between the existing underground concrete framework and the first formwork body with fluidized soil to construct a fluidized soil wall; vertically providing a second formwork body on an inner circumferential face of the fluidized soil wall at a predetermined distance from the fluidized soil wall; and casting concrete in between the fluidized soil wall and the second formwork body to construct a new underground concrete framework.

[0010] In this case, it is desired that the first formwork body and the second formwork body are kept upright by separators, and further it is desired that the first formwork body and the second formwork body are formwork panels formed by bending and cutting a plate-like steel material into a substantially rectangular front shape and a substantially angular-wave-like cross-sectional shape.

Advantageous Effects of the Invention

[0011] According to the present invention, since the new underground concrete framework formed within the existing underground concrete framework is composed of the fluidized soil wall and the new underground concrete framework when a new underground structure is constructed, the usage of concrete can be reduced as compared with the case where the new underground concrete framework is composed of only the new underground concrete framework. Further, since fluidized soil has a lower specific gravity than concrete, the load imposition of the new underground concrete framework on the existing underground concrete framework can be reduced.

BEST MODE FOR CARRYING OUT THE INVENTION

[0012] Hereinafter, a construction method for a new underground structure according to an embodiment of the present invention will be described with reference to the drawings.

[0013] FIG. 1 is a vertical sectional side view showing the structure of a new underground structure constructed by the construction method according to the embodiment.

[0014] As shown in FIG. 1, the underground structure constructed by the construction method according to the embodiment is a new underground structure having a basement available as a residential space, and an underground pit which is a facility for housing piping equipment or the like, and the underground structure is constructed by holding a fluidized

soil wall **300** between an existing underground concrete framework **200** and a new underground concrete framework **400**.

[0015] The underground pit in this underground structure is an underground space for housing piping equipment or the like, but it is unnecessary to provide the underground pit if the basement has a space for housing piping equipment or the like. Further, though the underground structure shown in FIG. 1 is an underground structure having only a single basement floor, the number of underground floors may be plural, where the configuration and the construction method of a new underground structure according to the present invention are not changed.

[0016] When an existing underground structure is dismantled, a post and the like which were used to construct the underground structure are dismantled, and only the existing underground concrete framework **200** composed of an existing beam **201**, an existing load-bearing wall **202**, and an existing foundation (foundation/underground beam) **203** remains.

[0017] Within this existing underground concrete framework **200**, the fluidized soil wall **300** is constructed. This fluidized soil wall **300** is constructed by filling with fluidized soil (backfill material that is slurry backfill soil which has been preliminarily blended with cement in a controlled manner in a plant and which is fluidized so that it can be cast by a pump). Specifically, the fluidized soil wall **300** is constructed by driving formwork panels **500** within the existing underground concrete framework **200** at a predetermined distance therefrom, keeping the formwork panels **500** upright by separators **501**, filling a space between the formwork panels **500** and the existing underground concrete framework **200** with the fluidized soil, and solidifying the fluidized soil.

[0018] Then, a new framework, that is, the new underground concrete framework **400**, is constructed within the fluidized soil wall **300**. The new underground concrete framework **400** is composed of a new slab **401** which constitutes the floor of the basement and the ceiling of the underground pit, a new beam **402**, and a new wall **403**. This new underground concrete framework **400** is constructed by driving formwork panels **600** within the fluidized soil wall **300** at a predetermined distance therefrom, coupling these formwork panels **600** with the formwork panels **500** of fluidized soil wall **300** described above by means of separators **601** to keep the formwork panels **600** upright, and casting concrete in between the formwork panels **500** of the fluidized soil wall **300** and the new formwork panels **600**.

[0019] FIGS. 2 and 3 are views showing the configuration of the formwork panels **500** and **600** used in the construction method for an underground structure according to the embodiment.

[0020] As shown in FIG. 2, the formwork panels **500** and **600** are left-in-place type formwork panels formed by bending and cutting a plate-like steel material into a substantially rectangular front shape and a substantially angular-wave-like cross-sectional shape. Since this formwork panel **500** is configured such that a plurality of ridges **11** parallel to each other are formed at predetermined distances by bending a panel steel plate into a substantially angular-wave-like cross sectional shape, resulting in reinforcement of the strength of the panel itself. Further, by forming the panel cross section into an equilateral angular-wave-like shape, the panel exerts excellent strength against pressure on the front or back face of the panel.

[0021] It should be noted that, in the embodiment, a direction in which this ridges **11** are formed is defined as a longitudinal direction of the formwork panel **500**, and a direction perpendicular to the longitudinal direction is defined as a lateral direction of the formwork panel **500**.

[0022] As shown in FIGS. 2 and 3, this ridge **11** is composed of a top face **31**, and two side faces **32** provided so as to connect to the top face **31** in both lateral directions thereof. Further, in a recessed face between the respective ridges **11**, a plurality of ribs **12** raised in their lateral cross section and grooves **16** recessed in their lateral cross section are alternately formed in parallel to the ridges **11**.

[0023] Further, in both ends of the ridge **11** in the panel lateral direction, that is, on boundary lines between the ribs **12** and the grooves **16** adjacent to the ribs **12**, slits **13** each having a predetermined length are provided at predetermined distances like broken lines in parallel with the ridges **11**. By bending the formwork panel **500** at a predetermined angle along this row of broken-line-like slits **13**, a corner portion can be formed in the formwork. Further, by bending the formwork panel **500** along this row of broken-line-like slits **13** forward and backward alternately and repeatedly, the formwork panel **500** can easily be cut into a desired size.

[0024] This slit **13** is a slit having a very narrow width and a predetermined length and penetrating the formwork panel **500**. This slit **13** is formed so as to have a width (clearance) and a length which allow discharge of excess water contained in concrete or fluidized soil but do not allow leakage of liquid concrete or fluidized soil from the slit **13** after casting of concrete or filling with fluidized soil.

[0025] The top face **31** of the ridge **11** is provided with a plurality of flap-like lids **14**. By opening these lids **14**, separator insertion holes are formed. By inserting the above-described separators **501** and **601** into these separator insertion holes and fastening the separators together by a predetermined method, the formwork panels **500** and **600** can be kept upright.

[0026] FIG. 4 is a view showing an X-X section in FIG. 1.

[0027] As shown in FIG. 4, the new underground structure is a structure having the fluidized soil wall **300** between the existing underground concrete framework **200** and the new underground concrete framework **400**.

[0028] In order to construct the fluidized soil wall **300**, first, the formwork panels **500** are driven, then anchors **307** are driven into the existing underground concrete framework **200**, then these driven anchors **307** are coupled with the separators **501**, then the formwork panels **500** are kept upright by these separators **501**, and then the space between the formwork panels **500** and the existing underground concrete framework **200** is filled with fluidized soil, resulting in construction.

[0029] Washers **301** and **302** each having its both ends bent are provided at connections between the formwork panels **500** and the separators **501**. The washer **301** is provided on the back face of the formwork panel **500** (on the side of the existing underground concrete framework **200**), and fastened to the formwork panel **500** by a nut **303**. The washer **302** is provided on the front side of the formwork panel **500** (on the side of the new underground concrete framework **400**). The washer **302** is a washer which is long in the longitudinal direction, and fastened, by a long nut **304**, to a distal end of the separator **501** protruding from the formwork panel **500**. Then, the fluidized soil wall **300** is constructed by filling the space

between the existing underground concrete framework 200 and the formwork panels 500 with fluidized soil.

[0030] The new underground concrete framework 400, as described above, is constructed by driving the new formwork panels 600 within the fluidized soil wall 300 at a predetermined distance therefrom, coupling these formwork panels 600 with the formwork panels 500 for the fluidized soil wall 300 by means of the separators 601 so as to keep the formwork panels 600 upright, and casting concrete in between the formwork panels 500 of the fluidized soil wall 300 and the new formwork panels 600. At this time, the formwork panel 600 is kept upright by coupling one end of the separator 601 with the long nut 304 and coupling the other end thereof with the formwork panel 600, and a pipe 305 is provided on front faces of the formwork panels 600 and fixed thereto by form ties 306. In this state, by casting concrete in between the formwork panels 500 and the formwork panels 600, the new underground concrete framework 400 is constructed.

[0031] FIG. 5 is a flowchart showing a construction procedure of the underground structure, and FIGS. 6 to 11 are views showing a construction method for the underground structure according to the embodiment performed on the basis of the construction procedure.

[0032] Hereinafter, the construction method for the underground structure will be described, based on the flowchart showing the construction procedure in FIG. 5, with reference to FIGS. 6 to 11.

[0033] FIG. 6A is an illustration after the existing underground concrete framework is partially removed, FIG. 6B is an illustration where soil is carried into the underground pit after the partial removal of the existing underground concrete framework, FIG. 7A is an illustration where soil is carried into the existing underground concrete framework, FIG. 7B is an illustration where a new pile is set up in part of the foundation, FIG. 8A is an illustration where the backfill soil is removed down to a depth to which the existing load-bearing wall and the existing beam can bear soil pressure, and a strut and a wale for land retaining are set up, FIG. 8B is an illustration where a fluidized soil wall is provided in the underground pit, FIG. 9A is an illustration where a concrete framework of a new pressure plate is provided in the underground pit, FIG. 9B is an illustration where a new concrete foundation and a slab are provided in the underground pit, FIG. 10A is an illustration where a strut and wale for land retaining is dismantled and removed, FIG. 10B is an illustration where a fluidized soil wall is provided in the basement, FIG. 11A is an illustration where formwork panels for a new underground concrete framework are assembled in the basement, and FIG. 11B is an illustration where the new underground concrete framework is provided in the basement.

[0034] <Partial Removal of the Existing Underground Concrete Framework>

[0035] First, as shown in FIG. 6A, after an aboveground structure is removed, existing posts 204 constructed in the basement and the underground pit of the existing underground concrete framework 200 are dismantled and removed, an opening is created by dismantling slabs 205 and 206 in the basement and the underground pit (the removal may be performed with the existing beam 201 left so as to receive soil pressure), and an opening is created by dismantling an existing pressure plate 208 partially (step S100). By dismantling and removing the existing posts 204, spaces for constructing new underground concrete frameworks in the basement and the underground pit are secured, and by dismantling the slabs

205 and 206 with the existing beam 201 left to create an opening, a work space are secured.

[0036] Moreover, in the embodiment, the existing beam 201, the existing load-bearing wall 202, and the existing foundation 203 of the existing underground concrete framework 200 are considered as a continuous existing exterior wall, and utilized as a retaining wall for supporting underground soil pressure.

[0037] <Backfilling Work and Setting Up of a New Pile>

[0038] Next, the existing underground concrete framework 200 is backfilled with soil by carrying soil into the underground pit of the existing underground concrete framework 200, as shown in FIG. 6B, and carrying soil into the basement, as shown in FIG. 7A, from the opening created by dismantling the slabs 205 and 206 with the existing beam 201 left (step S101). This backfilling work can reduce the load of soil pressure on the existing underground concrete framework 200 utilized as a retaining wall. Further, this backfilling work makes it possible to secure a work space for heavy equipment (not shown) on the ground and to support the weight of the heavy equipment, and by this heavy equipment, as shown in FIG. 7B, a new pile 405a can be set up in a hole 405 preliminarily opened in the existing pressure plate 208 (step S102). This new pile 405a is for supporting the weight of a new underground concrete framework (mainly a new wall) constructed within the existing underground concrete framework 200.

[0039] In addition, the new pile 405a is not necessarily set up, depending on load-bearing performances of the existing foundation 203 and the existing pressure plate 208 of the existing underground concrete framework 200, and a bearing power that is the bearing capacity of the ground.

[0040] <Removal of Backfill Soil and Setting Up of a Strut and Wale for Land Retaining>

[0041] Next, as shown in FIG. 8A, after the new pile 405a is set up, the backfill soil is removed from the basement and the underground pit down to a depth to which the existing load-bearing wall 202 and the existing beam 201 can bear soil pressure (step S103), and the remaining existing beam 201 is removed. Next, since the soil pressure applied on the existing underground concrete 200 from the surrounding ground increases due to the dismantlement and removal of the existing beam 201 and the removal of the backfill soil, a strut and wale for land retaining 406 is set up in a part of the existing beam 201 for a temporary aid (step S104). As the strut and wale for land retaining 406, land retaining H-section steels are used. Therefore, the soil pressure applied on the existing underground concrete framework 200 can be reduced by the strut and wale for land retaining 406. After the strut and wale for land retaining 406 is set up, the remaining backfill soil is removed (step S105).

[0042] <Construction of a Fluidized Soil Wall in the Underground Pit>

[0043] Next, as shown in FIG. 8B, with the existing underground concrete framework 200 and the strut and wale for land retaining 406 supporting the soil pressure from the ground, the fluidized soil wall 300 is constructed in the underground pit. In order to construct this fluidized soil wall 300, first, a plurality of anchors 307 are driven into the existing foundation 203 which functions as a wall of the underground pit, and separators 501 are coupled with the respective anchors 307 (step S106). Next, the above-described formwork panels 500 are assembled so as to fit on the internal shape of the existing underground concrete framework 200,

and these formwork panels **500** are kept upright by the separators **501** (step S107). Further, the formwork panels **500** and the separators **501**, as described above, are fastened to each other with washers **301** and **302** and nuts **303** to be fixed to each other.

[0044] Next, the fluidized soil wall **300** is constructed in the underground pit by filling a space between the existing foundation **203** and the formwork panels **500** with fluidized soil and solidifying the fluidized soil (step S108). The fluidized soil used here is slurry backfill soil which is preliminarily blended with cement in a controlled manner in a plant and which can be transported by a fresh concrete mixer vehicle and can be cast by a pump. And, by using the formwork panels **500** when constructing the fluidized soil wall **300**, excess water can be discharged through the slits **13** created in these formwork panels **500**, and therefore the time required to harden the fluidized soil can be shortened.

[0045] <Constructing of a New Underground Concrete Framework in the Underground Pit>

[0046] Next, as shown in FIG. 9A, reinforcing bars (not shown) for constructing a new pressure plate **407** are assembled on the existing pressure plate **208** in the underground pit (step S109), and concrete for constructing the new pressure plate **407** is cast (step S110). Next, as shown in FIG. 9B, in order to construct a new slab **401** and a new foundation (foundation/underground beam) **404**, formwork panels **600** are set up within the fluidized soil wall **300** (step S111). First, reinforcing bars are assembled within the fluidized soil wall **300** (step S112), separators **601** are coupled with the separators **501** protruding from the formwork panels **500**, and the assembled formwork panels **601** are kept upright by these separators **601**. Further, in order to construct the new slab **401** for the underground pit, formwork panels **600** are provided so as to form a shape of a slab while being supported by a supporting post. At this time, since the formwork panel **600** can easily be bent along the slits **13** created in the formwork panel **600**, the formwork panels **600** can be assembled into the shape of a slab. Further, the formwork panels **600** kept upright and the formwork panels **600** assembled into the shape of a slab are set up so as to connect to each other.

[0047] In the formwork panels **600** thus set up, in order to support lateral pressure applied to the formwork panels **600** when concrete is cast, the pipe **305** extending in the longitudinal direction of the formwork panels **600** is fixed on the side of surfaces of the formwork panels **600** by the form ties **306**, as described above. Next, the new slab **401** and the new foundation **404** are constructed by casting concrete (step S113). In this manner, the new underground concrete framework **400** can be constructed in the underground pit.

[0048] Further, when the new underground concrete framework **400** is constructed, the slits **13** created in the formwork panels **600** can prevent leakage of concrete and can discharge excess water in the concrete when the concrete is cast.

[0049] <Building of a Fluidized Soil Wall in the Basement>

[0050] Next, as shown in FIG. 10A, the strut and wale for land retaining **406** set up to the existing beam **201** is dismantled and removed (step S114), and, as shown in FIG. 10B, a fluidized soil wall **300** is constructed in the basement.

[0051] First, a plurality of anchors **307** are driven into the existing beam **201** and the existing load-bearing wall **202** of the existing underground concrete framework **200**, and the respective anchors **307** are coupled with separators **501** (step S115). Next, formwork panels **500** are assembled so as to connect to the formwork panels **500** set up in the underground

pit, and kept upright by the separators **501** (step S116). At this time, the formwork panels **500** and the separators **501** are fastened and fixed to each other by washers **301** and **302** and nuts **303**.

[0052] Then, a fluidized soil wall **300** is constructed by filling a space between the existing underground concrete framework **200** and the formwork panels **500** with fluidized soil (step S117). Thus, the fluidized soil wall **300** constructed in the underground pit and the fluidized soil wall **300** constructed in the basement are constructed as a continuous single wall. And, the load of this fluidized soil wall **300** is supported by the existing beam **201**, the existing load-bearing wall **202**, and a part of the existing foundation **203** that constitute the existing underground concrete framework **200**.

[0053] <Constructing of a New Underground Concrete Framework in the Basement>

[0054] Next, as shown in FIG. 11A, on the new underground concrete framework **400** constructed in the underground pit, reinforcing bars are assembled to construct a post, a beam, a wall, and a floor that constitute the new underground concrete framework **400** (step S118). Next, separators **601** are coupled with the separators **501** protruding from the formwork panels **500** of the fluidized soil wall **300** constructed for the basement (steps S119), and formwork panels **600** are kept upright by these separators **601**. Then, formwork panels **600** for constructing the new slab **401** and the new beam **402** for the basement are assembled (step S120). These formwork panels **600** are supported by supporting posts.

[0055] It should be noted that the formwork panels **600** kept upright and the formwork panels **600** assembled into shapes of a slab and a beam are joined and assembled so as to obtain a continuous formwork panel **600**.

[0056] Next, reinforcing bars for the new slab **401** are assembled (step S121), and concrete is cast into a space between the fluidized soil wall **300** and the formwork panels **600** (step S122). In this manner, the new underground concrete framework **400** for the basement can be constructed. Further, the new underground concrete framework **400** constructed in the underground pit and the new underground concrete framework **400** constructed in the basement form a continuous new concrete framework, the weight of which is supported by the new pile **405a**.

[0057] As described above, in the construction method for an underground structure according to the embodiment, a new underground structure can be constructed, without dismantling the existing underground concrete framework, by utilizing this existing underground concrete framework as a retaining wall, and constructing the fluidized soil wall and the new underground concrete framework within the existing underground concrete framework.

[0058] And, since the fluidized soil wall and the new underground concrete framework which are constructed within the existing underground concrete framework are independent of each other via the formwork panel, the load of the fluidized soil wall can be supported by a portion contacting with the existing underground concrete framework, and the load of the new underground concrete framework can be supported by the new pile provided preliminarily and the foundation of the existing underground concrete framework.

[0059] Thus, since the loads of the fluidized soil wall and the new underground concrete framework can be distributed and supported by the existing underground concrete framework, the load supported by the existing underground concrete framework can be reduced.

[0060] Further, by providing the fluidized soil wall between the existing underground concrete framework and the new underground concrete framework, the fluidized soil wall makes it possible to reduce the thickness of the new underground concrete framework, as compared with the construction method in which the new underground concrete framework is directly provided in the existing underground concrete framework, and therefore the amount of concrete can be reduced.

[0061] Further, since the formwork panel according to the embodiment is formed by bending a panel steel plate into a substantially angular-wave-like cross sectional shape so as to have a plurality of ridges arranged in parallel at predetermined distances, the strength of the panel itself can be reinforced. This makes it possible for the formwork panel to sufficiently bear lateral pressure applied to the formwork panel even after filling with the fluidized soil or casting concrete. And, the slits with a predetermined length provided in this formwork panel make it easy to bend the formwork panel itself, and can promote discharge of excess water while preventing leakage of the fluidized soil or concrete. Thus, it becomes easy to bend the formwork panel at a corner, while constructing of the fluidized soil wall and the new underground concrete framework can be expedited.

BRIEF DESCRIPTION OF THE DRAWINGS

[0062] FIG. 1 is a view showing the configuration of a new underground structure according to an embodiment of the present invention;

[0063] FIG. 2 is a schematic configuration view of a formwork panel used in the embodiment;

[0064] FIG. 3 is a view showing an A-A cross section of the formwork panel shown in FIG. 2;

[0065] FIG. 4 is a cross-sectional view showing an X-X cross section of the underground structure shown in FIG. 1;

[0066] FIG. 5 is a flowchart showing the procedure of a construction method of the new underground structure according to the embodiment;

[0067] FIG. 6 is a schematic illustration of the construction method of the new underground structure according to the embodiment;

[0068] FIG. 7 is a schematic illustration of the construction method of the new underground structure according to the embodiment;

[0069] FIG. 8 is a schematic illustration of the construction method of the new underground structure according to the embodiment;

[0070] FIG. 9 is a schematic illustration of the construction method of the new underground structure according to the embodiment;

[0071] FIG. 10 is a schematic illustration of the construction method of the new underground structure according to the embodiment; and

[0072] FIG. 11 is a schematic illustration of the construction method of the new underground structure according to the embodiment.

EXPLANATION OF REFERENCE NUMERALS

[0073] 11: Ridge
[0074] 12: Rib
[0075] 13: Slit
[0076] 14: Lid
[0077] 16: Groove

[0078] 31: Top face
[0079] 32: Side face
[0080] 200: Existing underground concrete framework
[0081] 201: Existing beam
[0082] 202: Existing load-bearing wall
[0083] 203: Existing foundation (foundation or underground beam)
[0084] 204: Existing post
[0085] 205, 206: Slab
[0086] 208: Existing pressure plate
[0087] 300: Fluidized soil wall
[0088] 301, 302: Washer
[0089] 303: Nut
[0090] 304: Long nut
[0091] 305: Pipe
[0092] 306: Form tie
[0093] 307: Anchor
[0094] 400: New underground concrete framework
[0095] 401: New slab
[0096] 402: New beam
[0097] 403: New wall
[0098] 404: New foundation (foundation or underground beam)
[0099] 405: New hole
[0100] 405a: New pile
[0101] 406: Strut and wale for land retaining
[0102] 407: New pressure plate
[0103] 500, 600: Formwork panel
[0104] 501, 601: Separator

1. A construction method for a new underground structure by which a new underground concrete framework is constructed without entirely dismantling and removing an existing underground concrete framework, wherein:

a fluidized soil wall is constructed by filling an inner circumferential face of the existing underground concrete framework with fluidized soil, and the new underground concrete framework is constructed on an inner circumferential face of the fluidized soil wall.

2. A construction method for a new underground structure by which an existing underground concrete framework is partially utilized to construct a new underground concrete framework without entirely dismantling and removing the existing underground concrete framework, the method comprising:

vertically providing a first formwork body on the side of an inner circumferential face of the existing underground concrete framework at a predetermined distance from the existing underground concrete framework;

filling a space between the existing underground concrete framework and the first formwork body with fluidized soil to construct a fluidized soil wall;

vertically providing a second formwork body on the side of an inner circumferential face of the fluidized soil wall at a predetermined distance from the fluidized soil wall; and

casting concrete in between the fluidized soil wall and the second formwork body to construct the new underground concrete framework.

3. The construction method for a new underground structure according to claim 2, wherein the first formwork body and the second formwork body are kept upright by separators.

4. The construction method for a new underground structure according to claim 2, wherein the first formwork body and the second formwork body are formwork panels formed

by bending and cutting a plate-like steel material into a substantially rectangular front shape and a substantially angular-wave-like cross-sectional shape.

5. The construction method for a new underground structure according to claim 3, wherein the first formwork body

and the second formwork body are formwork panels formed by bending and cutting a plate-like steel material into a substantially rectangular front shape and a substantially angular-wave-like cross-sectional shape.

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