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JP 2018199946 A
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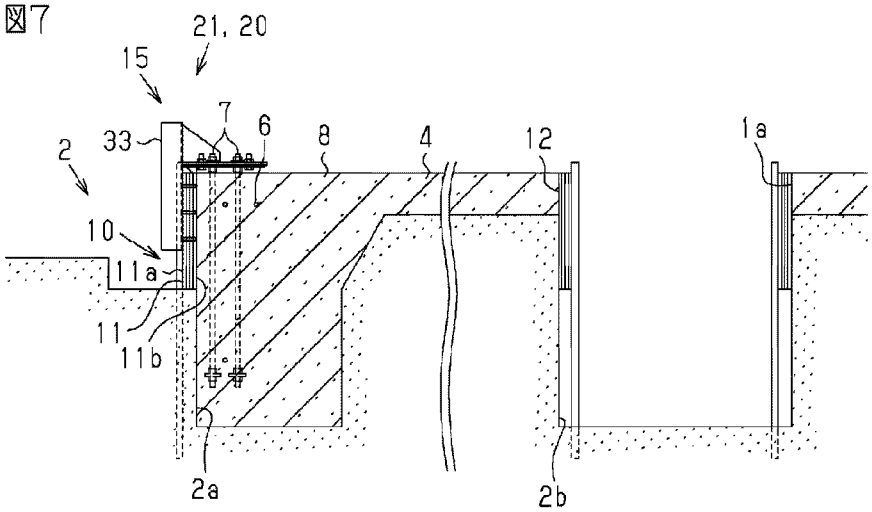
(54) Title of the Invention: **Foundation construction method and anchor support**
Abstract Title: **Foundation construction method and anchor support**

(57) This foundation construction method for a building includes: a first step for creating a foundation base (2); a second step for installing reinforcement on the foundation base (2); a third step for installing a frame (10) for creating a foundation to be provided to the foundation base (2); a fourth step for arranging a plurality of anchors so as to follow the inner periphery of the frame (10); and a fifth step for placing concrete (8) inside the frame (10). In the fifth step, the concrete (8) is leveled such that the upper surface of the concrete (8) is the same height as the upper end surface of the frame (10).

図7



This international application has entered the national phase early.

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Fig.1

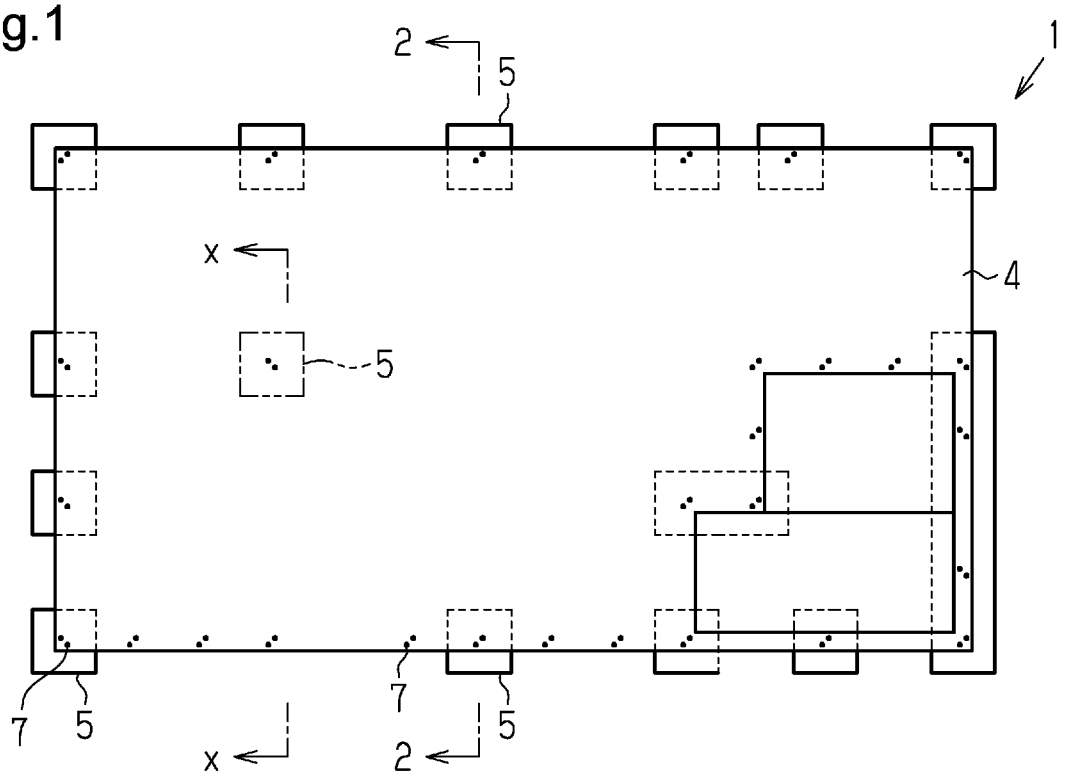


Fig.2

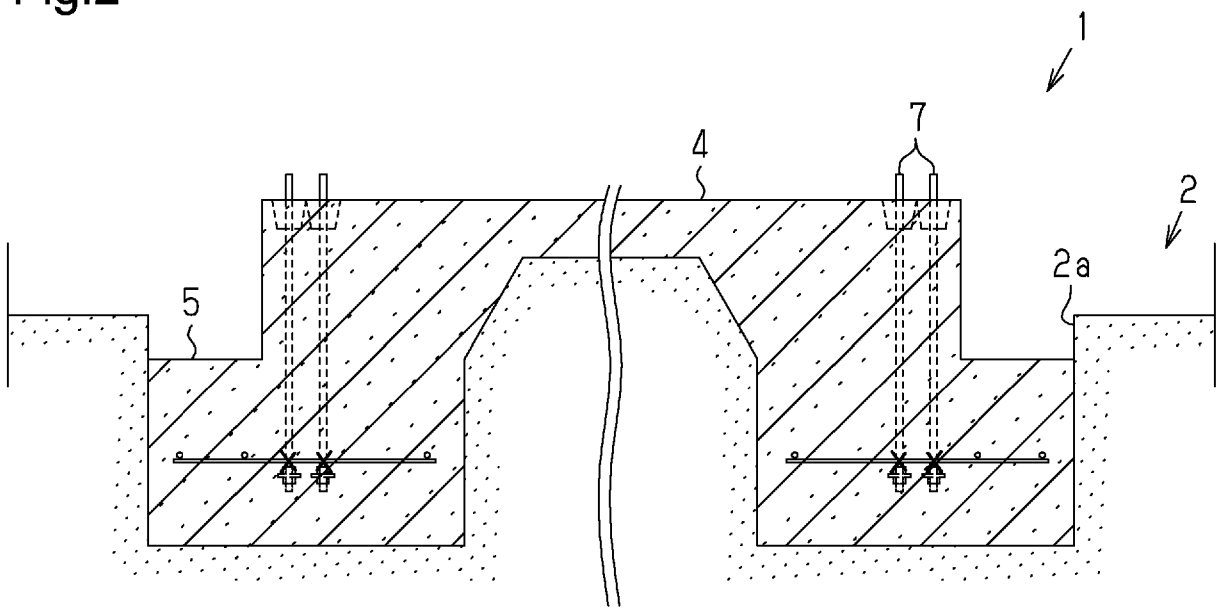


Fig.3

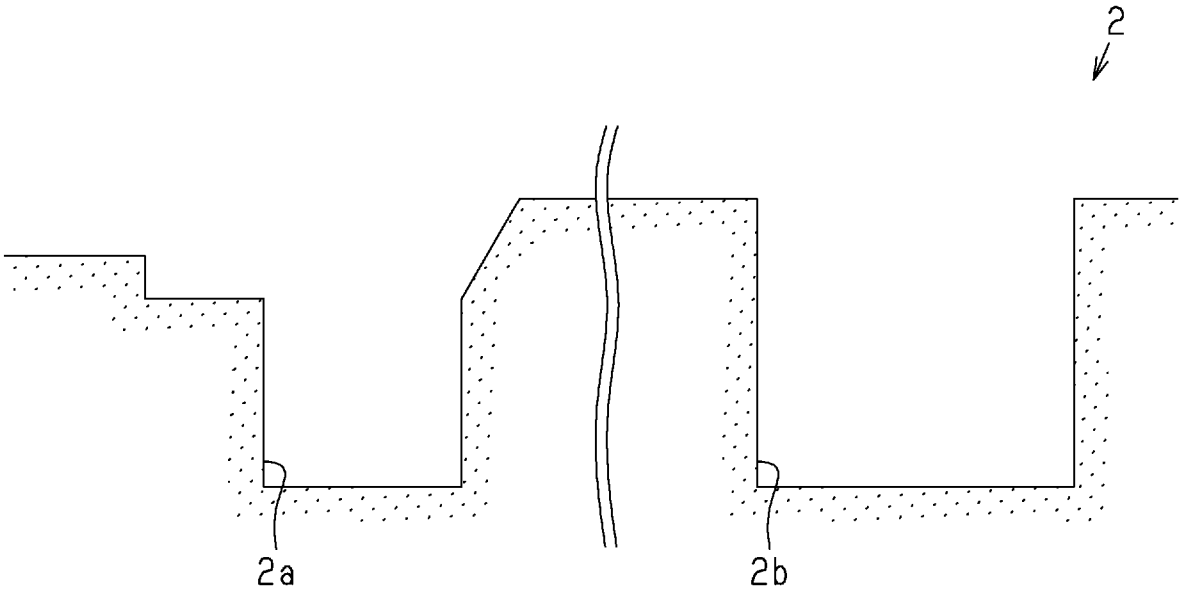


Fig.4

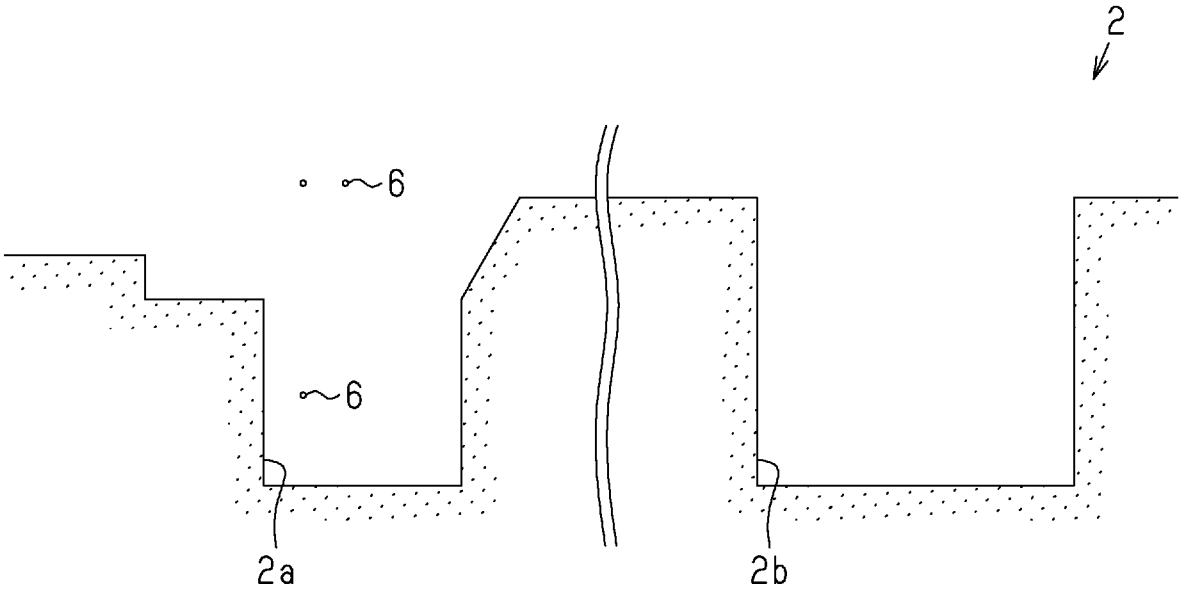
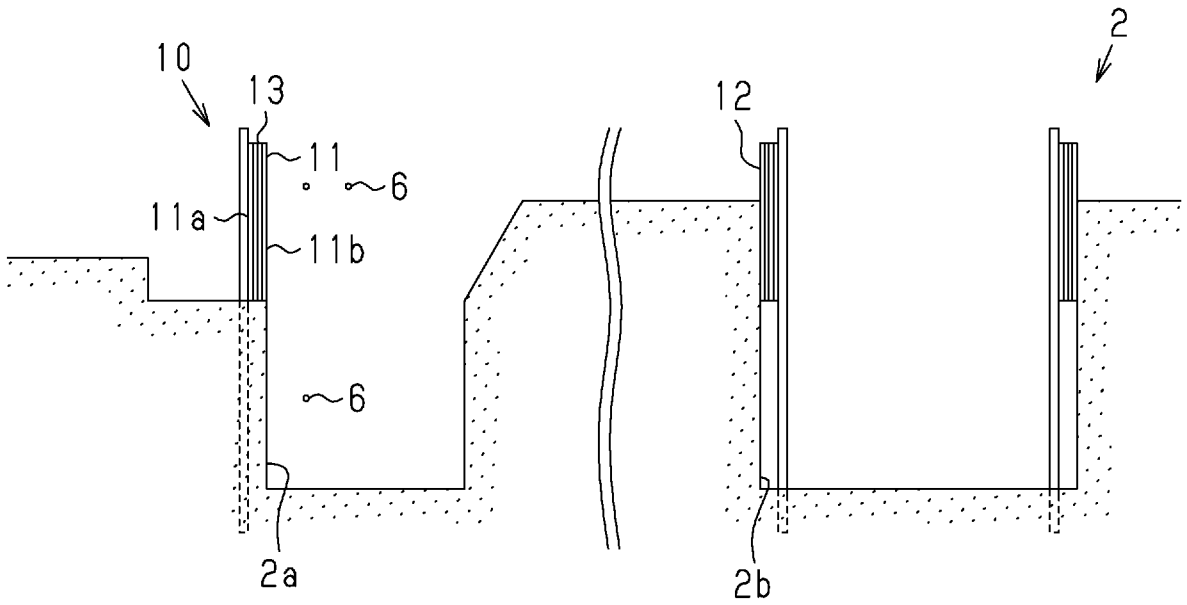


Fig.5



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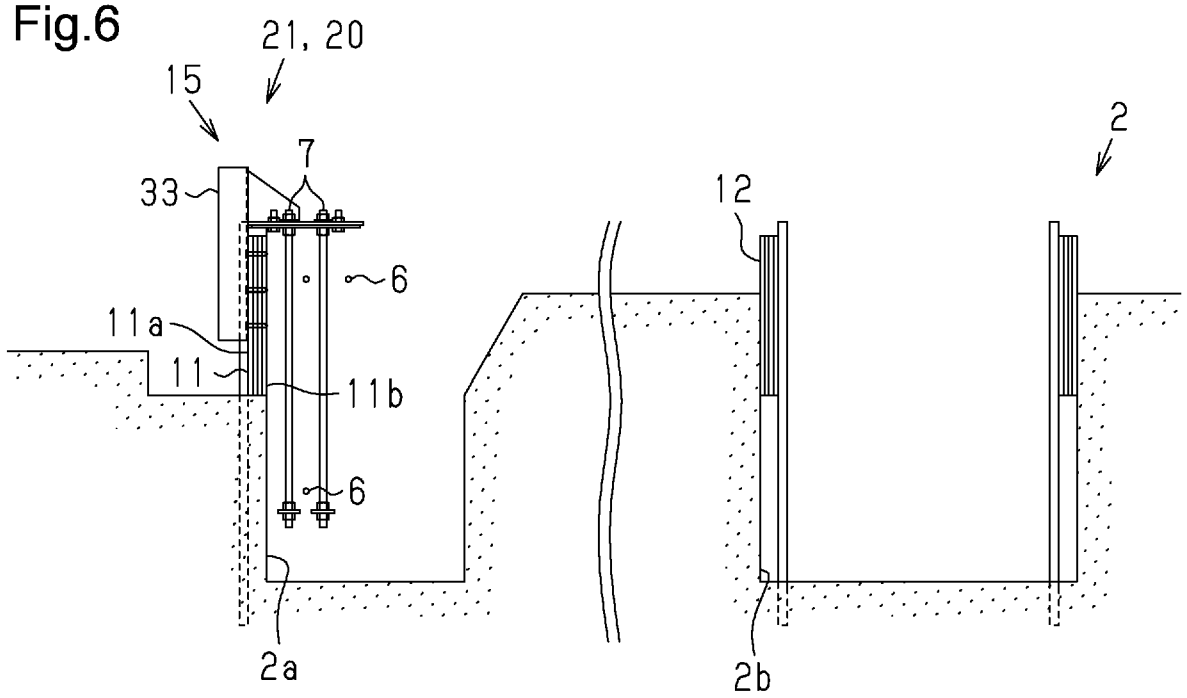

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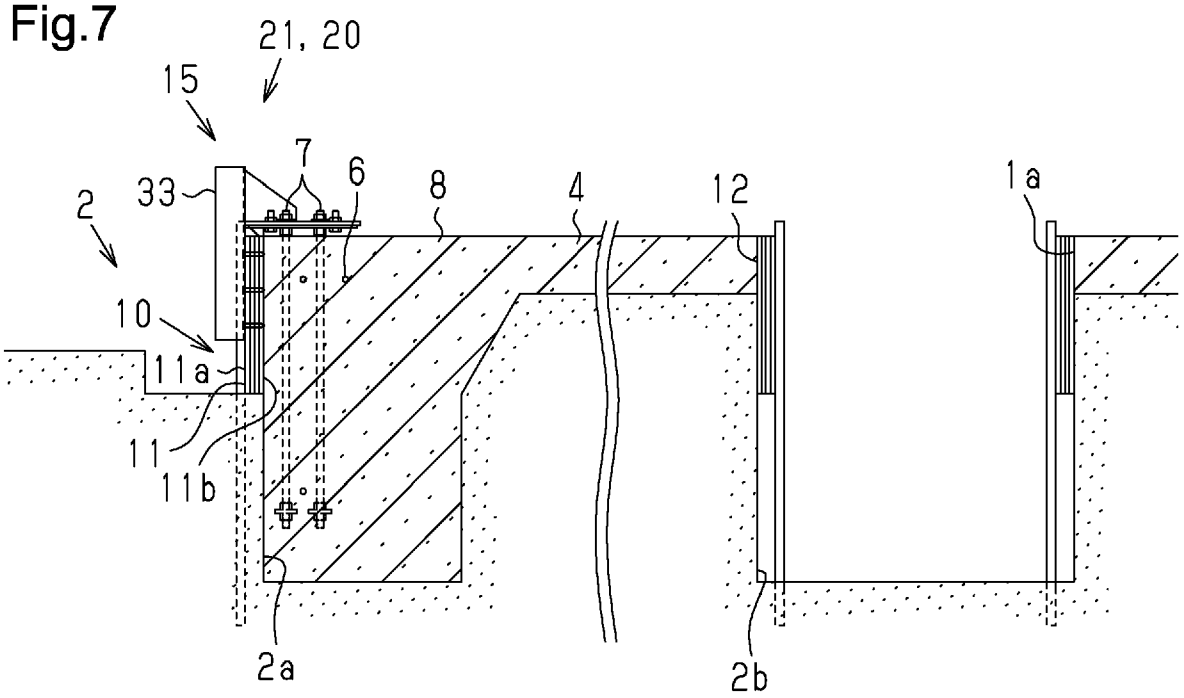
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Fig.8

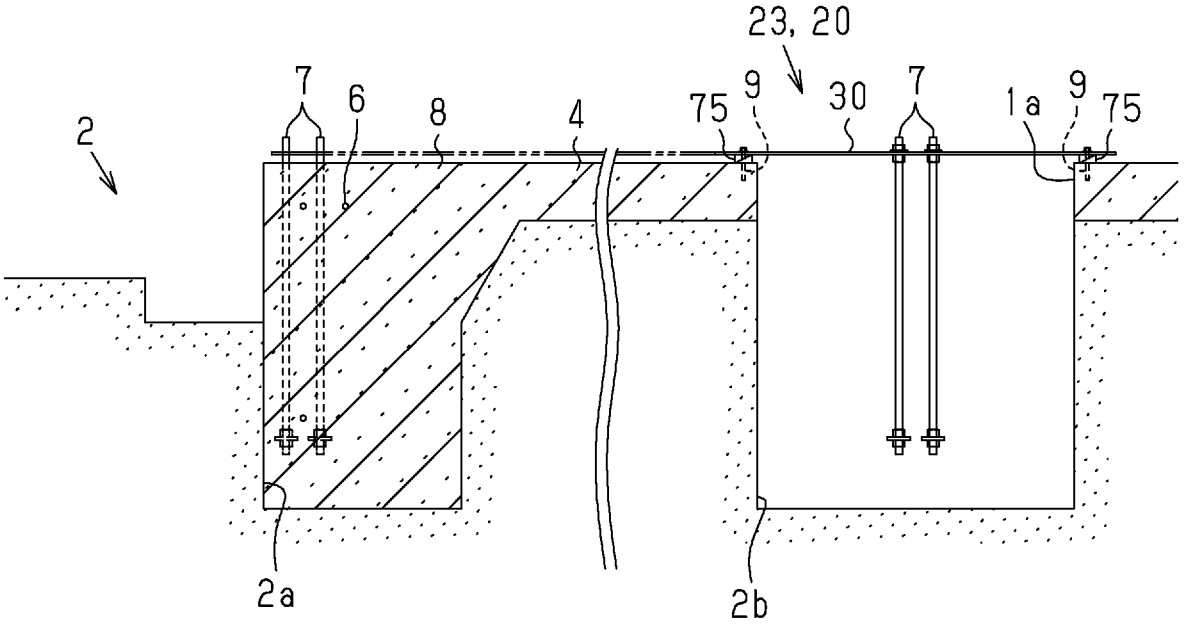
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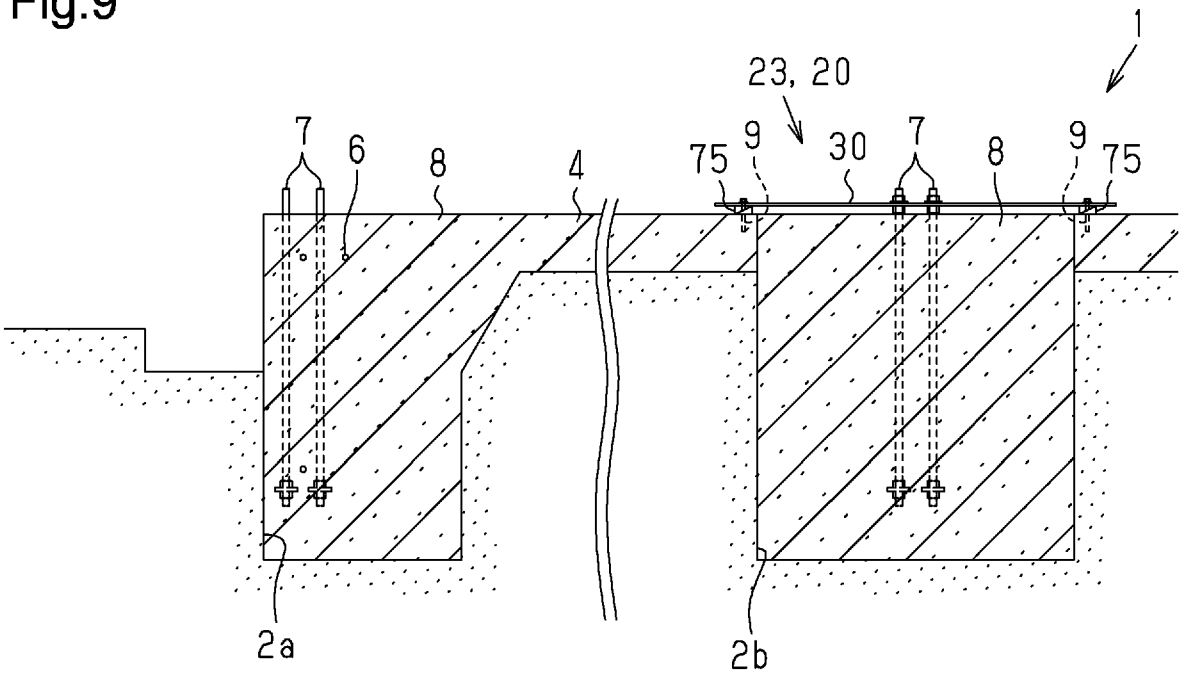
Fig.9



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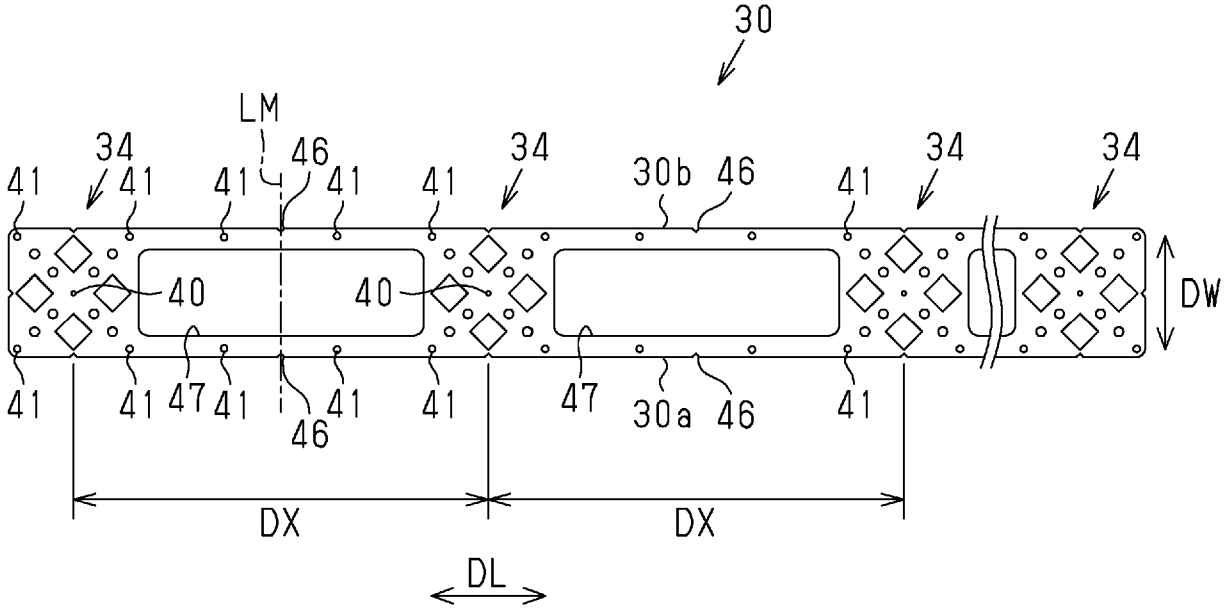

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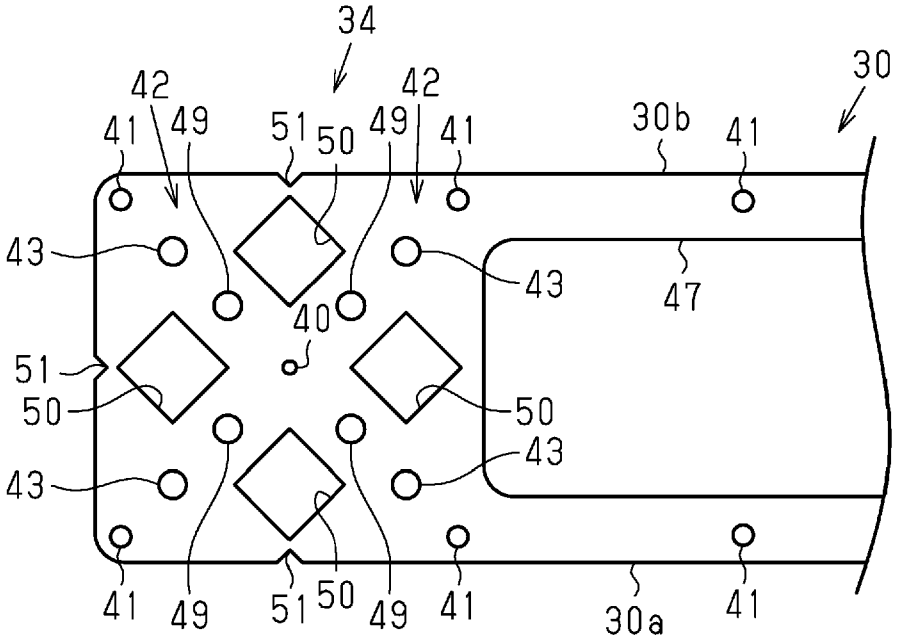

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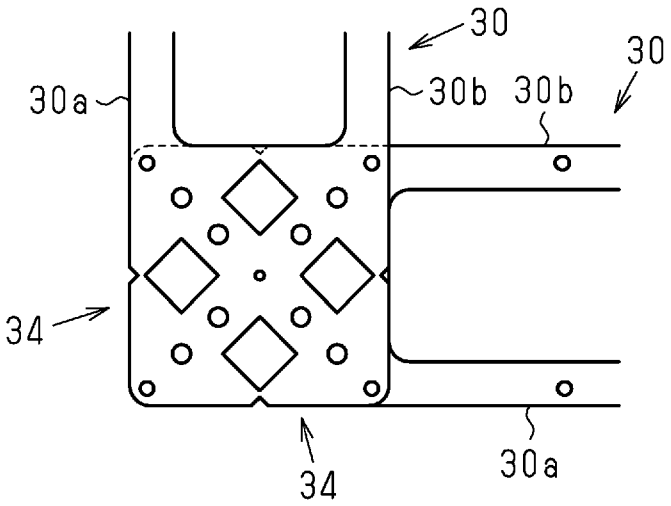

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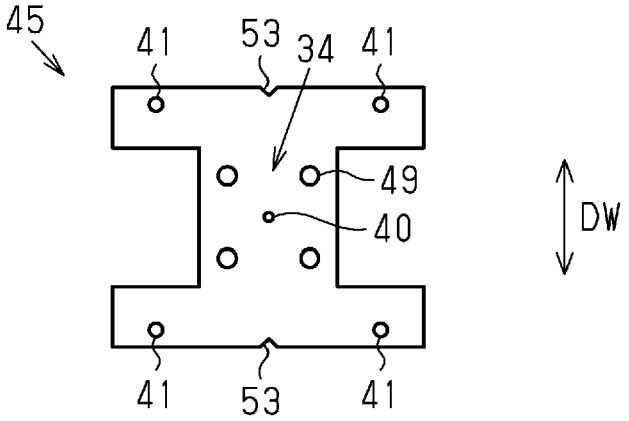

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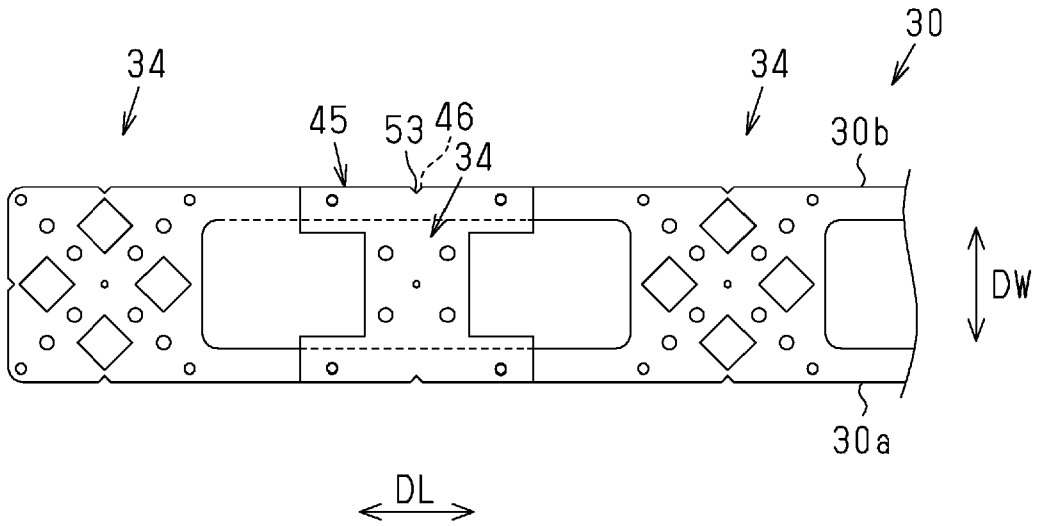
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Fig.15

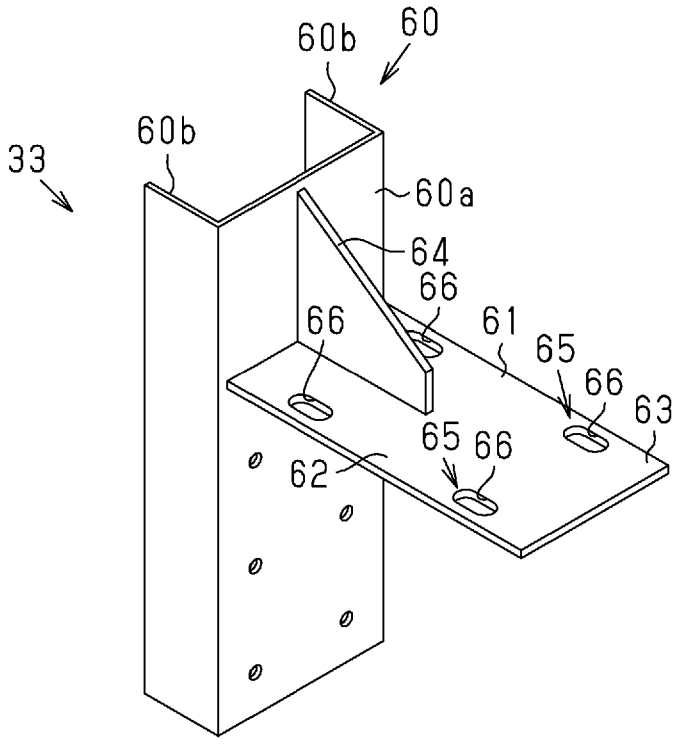
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Fig.16

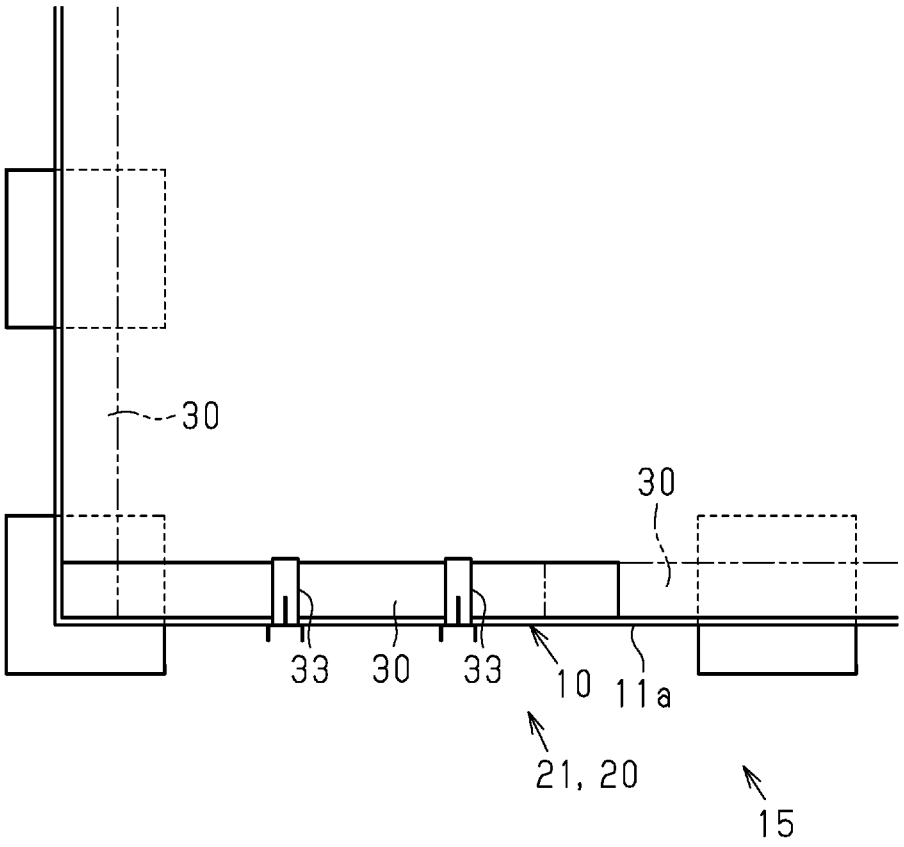
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Fig.17

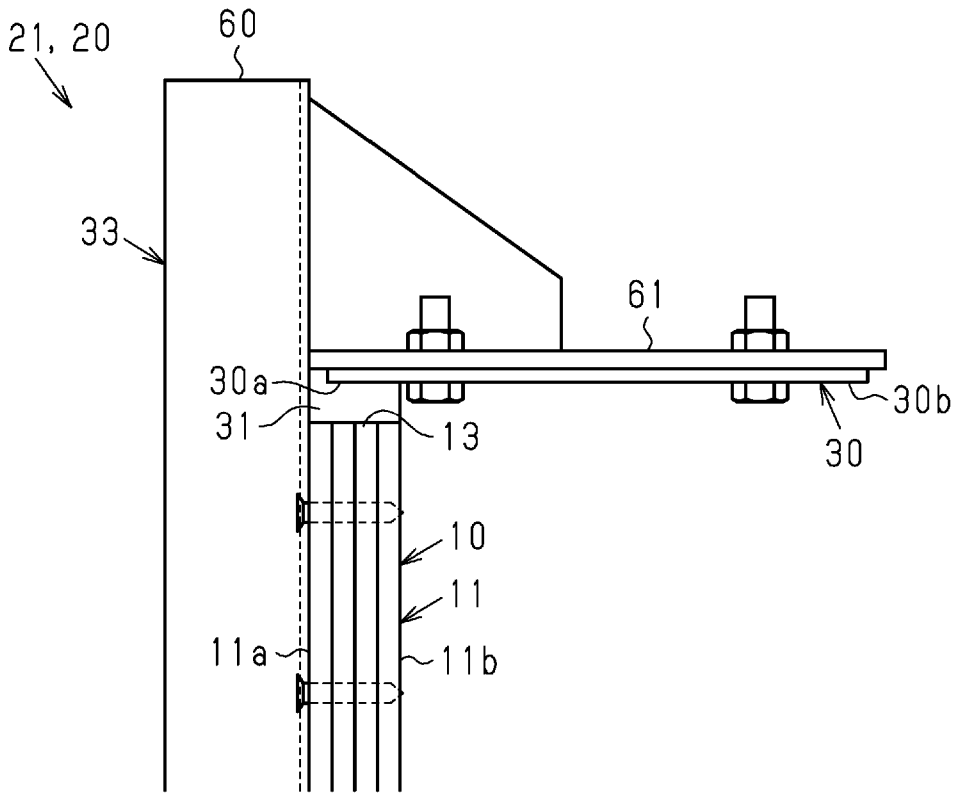
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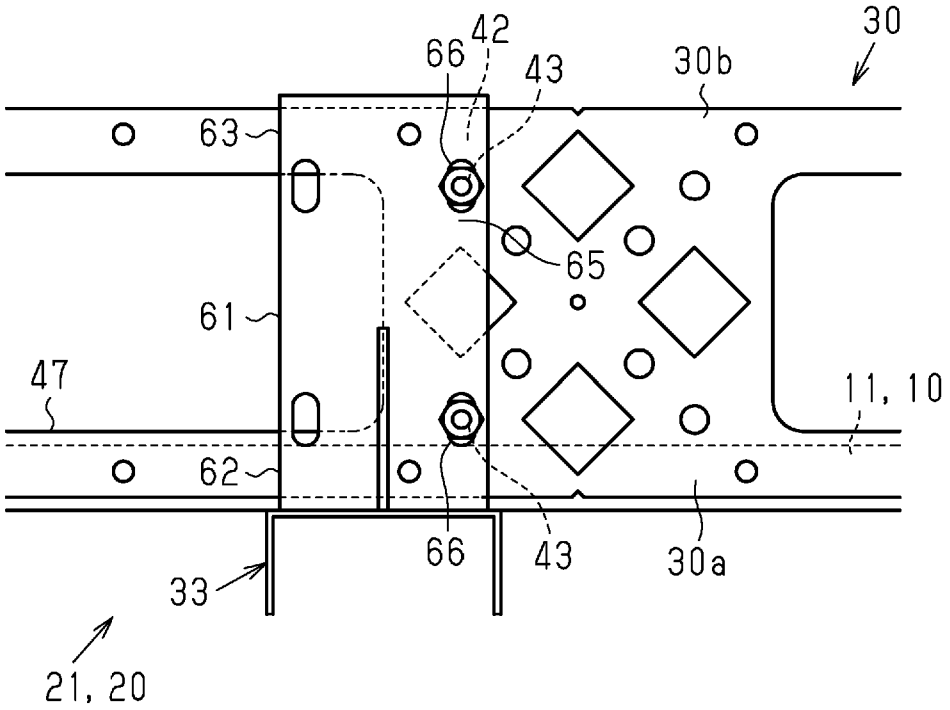
Fig.18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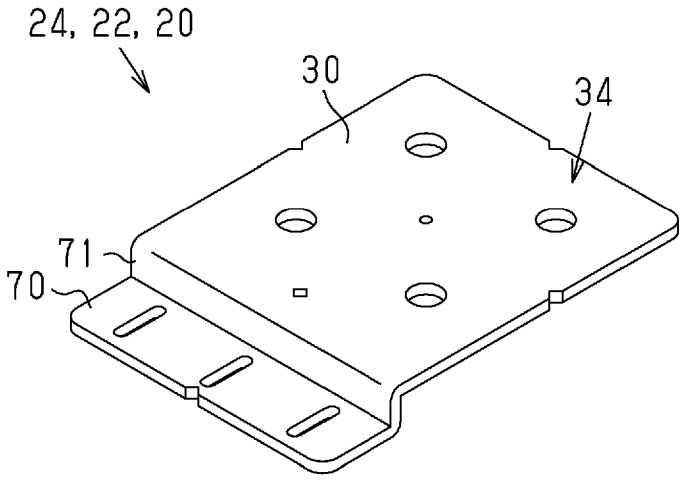
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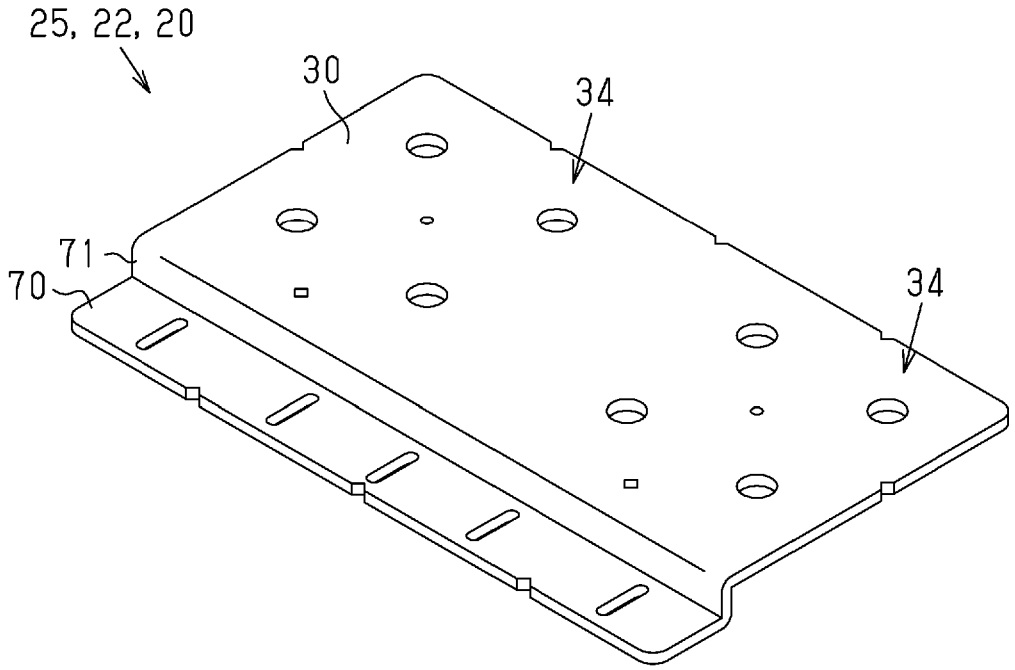
Fig.20



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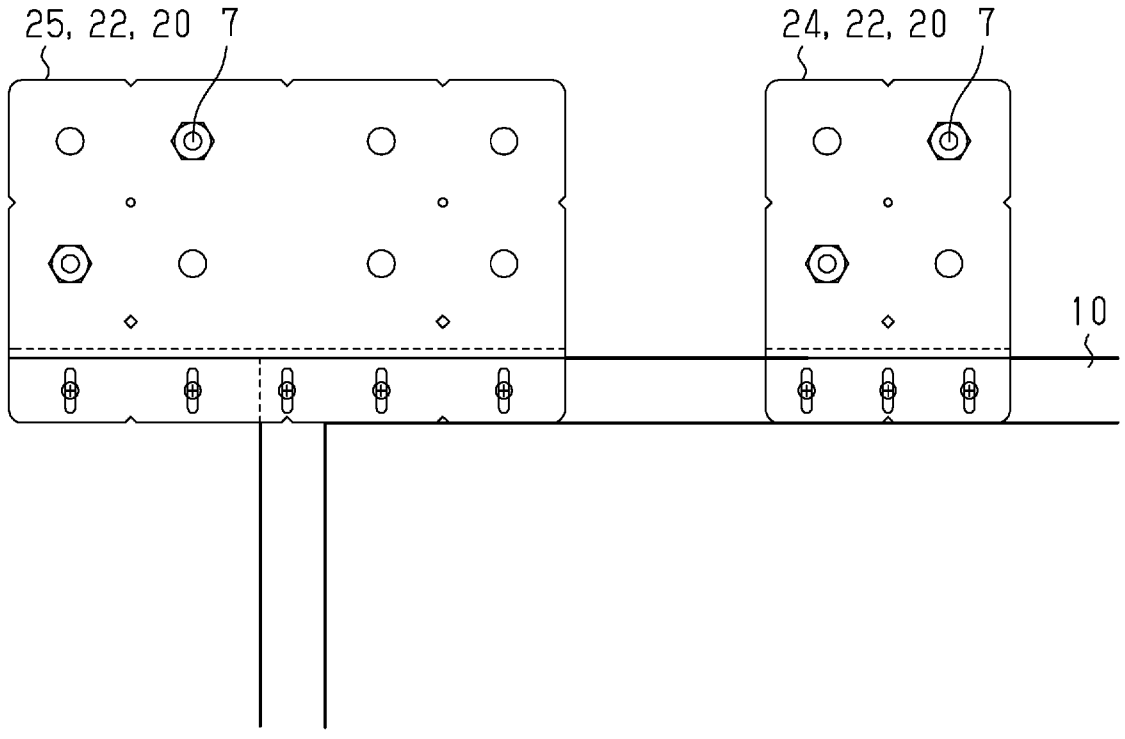

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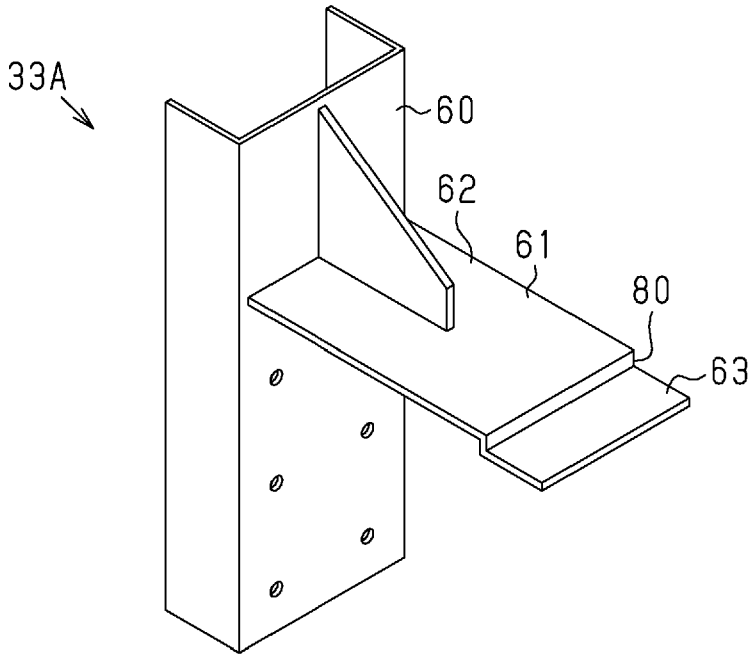

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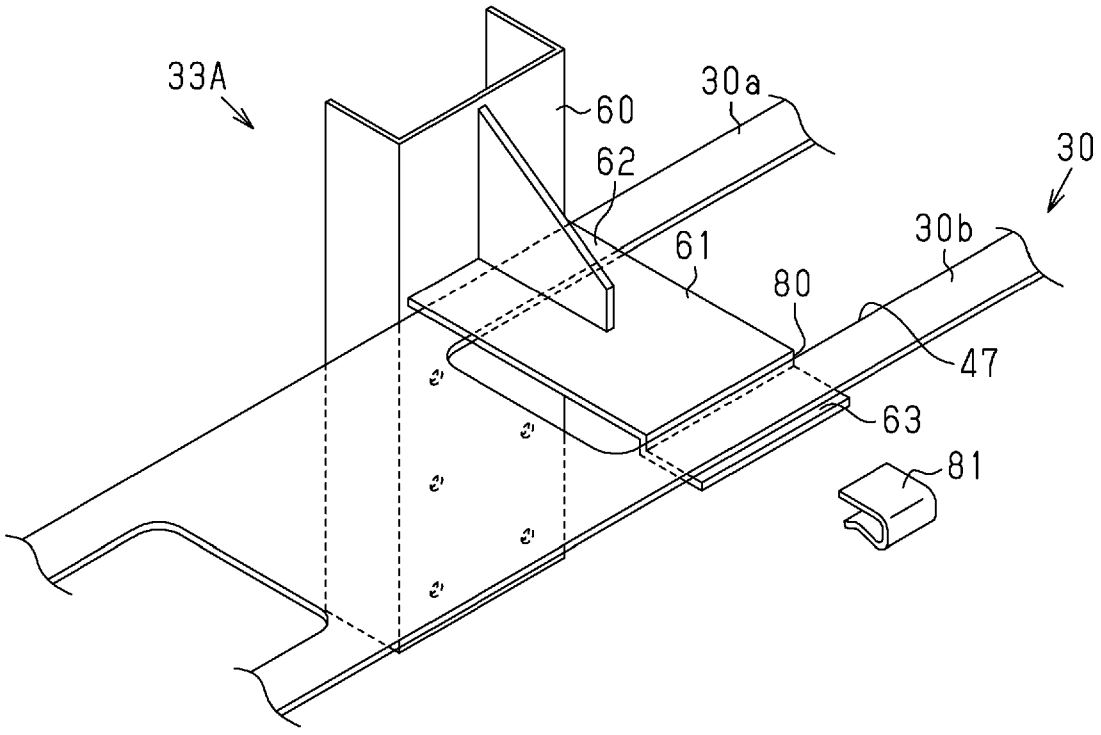
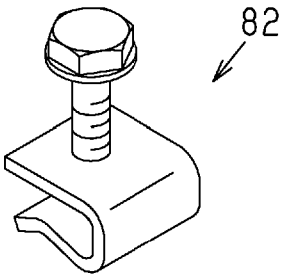


Fig.24



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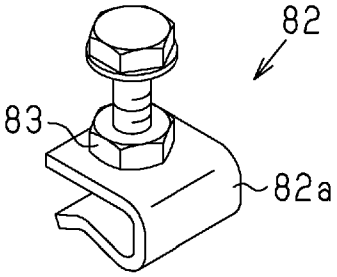


Fig.26

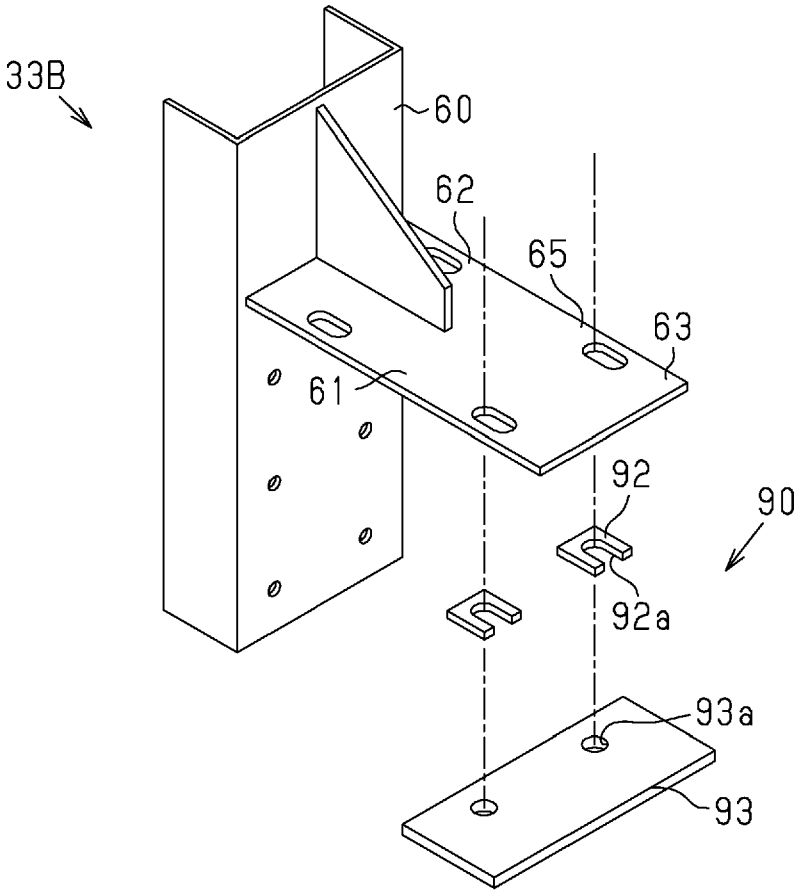


Fig.27

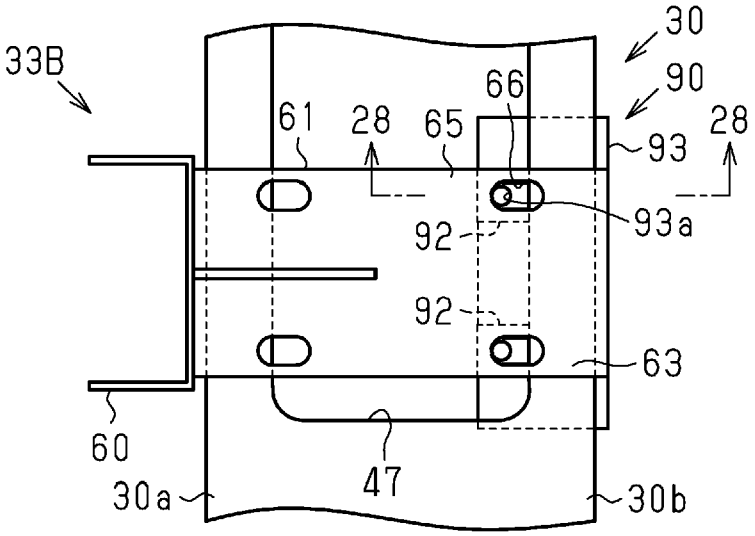


Fig.28

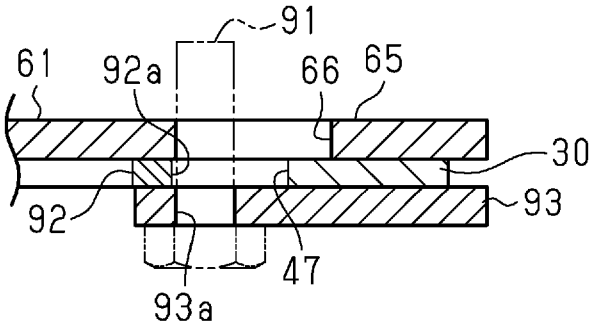


Fig.29

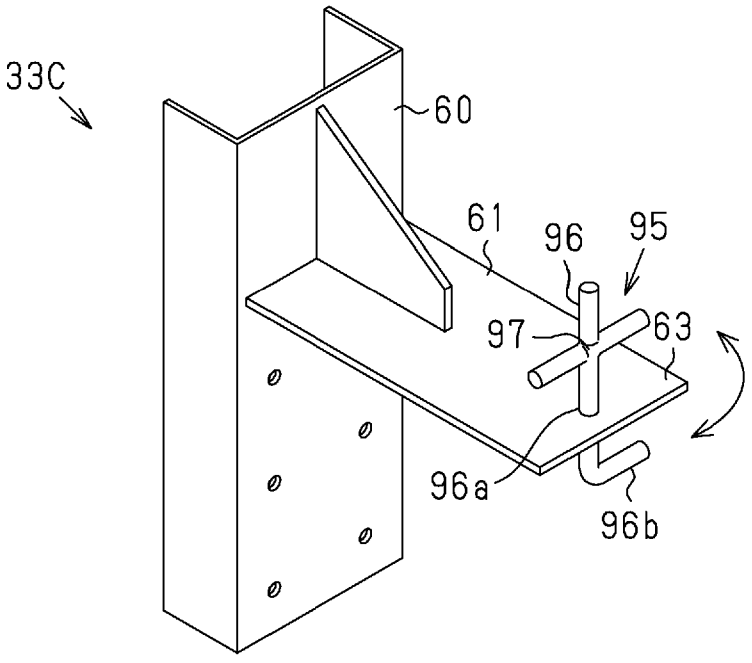


Fig.30

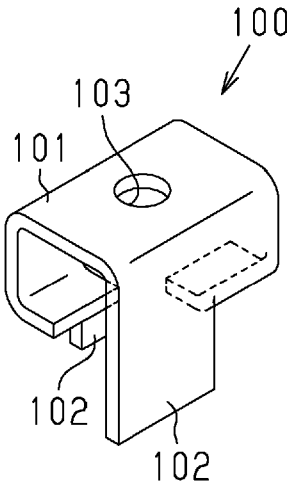
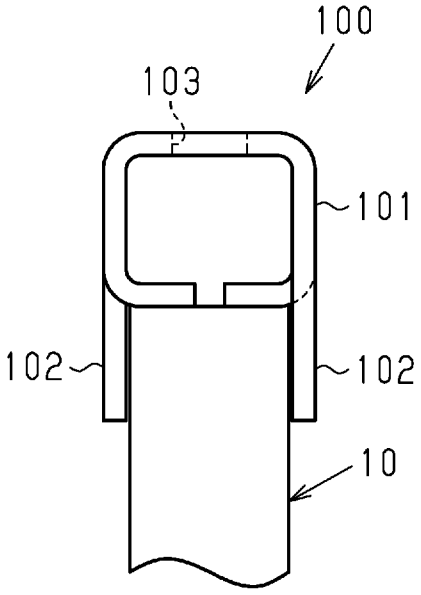


Fig.31



DESCRIPTION

TITLE OF INVENTION

FOUNDATION CONSTRUCTION METHOD AND ANCHOR SUPPORT

TECHNICAL FIELD

[0001] The present invention relates to a method for constructing a foundation and to an anchor support.

BACKGROUND

[0002] A known foundation of a building has an entirely flat upper surface. Patent Literature 1 discloses a foundation that does not include rising portions. For example, such a structure is employed in a mat foundation.

CITATION LIST

Patent Literature

[0003] Patent Literature 1: Japanese Laid-Open Patent Publication No. 2011-6849

SUMMARY OF INVENTION

Technical Problem

[0004] In the construction of such a foundation, forming the upper surface of the foundation to be flat at a predetermined height is difficult.

Solution to Problem

[0005] (1) A method for constructing a foundation of a building that solves the problem includes a first step that forms a foundation ground, a second step that installs a reinforcing bar on the foundation ground, a third step that installs a formwork, the formwork forming the foundation configured to be arranged on the foundation ground, a fourth step that arranges anchors along an inner surface of the formwork, and a fifth step that places concrete in the

formwork. In the fifth step, the concrete is leveled such that an upper surface of the concrete is located at the same height as an upper end surface of the formwork.

[0006] This configuration allows the concrete to be leveled with reference to the upper end surface of the formwork. Thus, the task of leveling the concrete is facilitated. Accordingly, the upper surface of the foundation is readily formed to be flat at a predetermined height.

[0007] (2) In the method according to the aspect (1), the fourth step includes a task of installing an anchor support such that at least one of the anchors is supported by the anchor support. The anchor support includes a support portion that supports the at least one of the anchors. In the task, the anchor support is fixed to the formwork such that the support portion is located at a higher position than the upper end surface of the formwork.

[0008] In this configuration, the support portion of the anchor support is located at a higher position than the upper end surface of the formwork. This allows the concrete to be leveled such that the upper surface of the concrete is located at the same height as the upper end surface of the formwork.

[0009] (3) In the method according to the aspect (2), the anchor support includes a first anchor support. The first anchor support include a support plate including the support portion, a fixing jig that fixes the support plate to the formwork, and a spacer configured to be arranged between an end of the support plate and the upper end surface of the formwork. In the fourth step, the spacer is arranged on the upper end surface of the formwork and the support plate is fixed to the formwork using the fixing jig with the end of the support plate placed on the spacer. In this configuration, the support plate is fixed to the formwork using the spacers. This allows the support plate to be readily arranged at a predetermined height from the upper end surface of the formwork.

[0010] (4) In the method according to the aspect (2) or (3), the anchor support includes a second anchor support. The second anchor support includes the support portion, a fixed

portion configured to be fixed to the formwork, and a coupling portion that couples the support portion to the fixed portion such that the support portion is located at a predetermined height from the fixed portion with the fixed portion arranged horizontally. In the fourth step, the fixed portion of the second anchor support is fixed to the upper end surface of the formwork. This configuration allows the support portion to be readily located at the predetermined height from the upper end surface of the formwork without using the spacer.

[0011] (5) The method according to any one of the aspects (1) to (4) further includes a sixth step and a seventh step that are performed after the fifth step. In the third step, an outer frame and an inner frame are installed as the formwork. The outer frame forms an outer surface of the foundation. The inner frame forms a footing at a middle portion of the foundation. In the fourth step, the anchors are arranged along an inner surface of the outer frame. In the fifth step, the concrete is placed in a space between the outer frame and the inner frame. In the sixth step, the anchors are each located at a predetermined position in a foundation hole formed by the inner frame. In the seventh step, the concrete is placed in the foundation hole and leveled such that an upper surface of the concrete is located at the same height as an upper surface of a surrounding portion of the foundation hole.

[0012] In this configuration, it is difficult to level the concrete such that the upper surface of the concrete placed in the foundation hole is located at a lower predetermined height than the upper surface of the surrounding portion of the foundation hole. In the above configuration, the concrete is leveled such that the upper surface of the concrete is located at the same height as the upper surface of the surrounding portion of the foundation hole. This facilitates the task of leveling the concrete.

[0013] (6) In the method according to the aspect (5), the sixth step includes a task of installing a third anchor support such that the at least one of the anchors is supported by the

third anchor support. The third anchor support includes a support plate that supports the at least one of the anchors. In the task of the sixth step, the third anchor support is installed on a portion around the foundation hole such that the support plate is located at a higher position than the upper surface of the surrounding portion of the foundation hole.

[0014] In this configuration, the support plate is located at a higher position than the upper surface of the foundation. This facilitates the task of leveling the concrete such that the upper surface of the concrete placed in the foundation hole is located at the same height as the upper surface of the surrounding portion of the foundation hole.

[0015] (7) In the method according to the aspect (6), in the sixth step, a reference anchor is driven into the surrounding portion of the foundation hole at a predetermined position and the support plate is arranged with reference to the reference anchor. In this configuration, the support plate is located at a predetermined position relative to the foundation hole. This allows the anchors supported by the support plate to be accurately located relative to the foundation hole.

[0016] (8) In the method according to the aspect (6), in the sixth step, the support plate is arranged with reference to the anchors that are arranged along the inner surface of the outer frame. In this configuration, the support plate is located at a predetermined position with respect to the anchors located along the outer frame. This allows the anchors supported by the support plate to be accurately located relative to the anchors located along the outer frame.

[0017] (9) An anchor support for a foundation that solves the problem is an anchor support that supports an anchor configured to be arranged on a foundation. The anchor support includes a support portion that supports the anchor, a fixed portion configured to be fixed to a formwork of the foundation, and a coupling portion that couples the support portion to the fixed portion such that the support portion is located at a predetermined height from the

fixed portion with the fixed portion arranged horizontally. The support portion includes a mark used to position the support portion relative to a reference of the foundation.

[0018] In this configuration, when the fixed portion is fixed to the formwork of the foundation, the support portion is located at a higher position than the upper end surface of the formwork. This allows the concrete to be leveled such that the upper surface of the concrete is located at the same height as the upper end surface of the formwork. The upper surface of the concrete does not include a portion concealed by the formwork. This allows the entire upper surface of the concrete to be seen and thus facilitates the task of leveling the concrete. Accordingly, the upper surface of the foundation is readily formed to be flat at a predetermined height. Further, the mark is aligned with the reference of the foundation so that the support portion is accurately located relative to the reference of the foundation.

Advantageous Effects of Invention

[0019] The method for constructing the foundation and the anchor support allows the upper surface of the foundation to be readily formed to be flat at a predetermined height.

BRIEF DESCRIPTION OF DRAWINGS

[0020] Fig. 1 is a plan view of a foundation.

Fig. 2 is a cross-sectional view of the foundation taken along line 2-2 in Fig. 1.

Fig. 3 is a cross-sectional view of the foundation in a first step.

Fig. 4 is a cross-sectional view of the foundation in a second step.

Fig. 5 is a cross-sectional view of the foundation in a third step.

Fig. 6 is a cross-sectional view of the foundation in a fourth step.

Fig. 7 is a cross-sectional view of the foundation in a fifth step.

Fig. 8 is a cross-sectional view of the foundation in a sixth step.

Fig. 9 is a cross-sectional view of the foundation in a seventh step.

Fig. 10 is a plan view of a support plate.

Fig. 11 is an enlarged view of the support plate.

Fig. 12 is a diagram showing an example of a combination of support plates.

Fig. 13 is a plan view of an additional support plate.

Fig. 14 is a plan view of the support plate to which the additional support plate is attached.

Fig. 15 is a perspective view of the fixing jig.

Fig. 16 is a diagram showing the arrangement of the formwork and the first anchor support.

Fig. 17 is a side view of the first anchor support fixed to the formwork.

Fig. 18 is a plan view of the first anchor support fixed to the formwork.

Fig. 19 is a perspective view of a fourth anchor support, which is an example of the second anchor support.

Fig. 20 is a perspective view of a fifth anchor support, which is another example of the second anchor support.

Fig. 21 is a diagram showing the arrangement of the fourth anchor support and the fifth anchor support.

Fig. 22 is a perspective view showing the fixing jig according to a first modification.

Fig. 23 is a diagram showing the relationship between the fixing jig of the first modification and the support plate.

Fig. 24 is a perspective view of a clip according to another example.

Fig. 25 is a perspective view of a clip according to a further example.

Fig. 26 is a perspective view of the fixing jig according to a second modification.

Fig. 27 is a plan view illustrating the relationship between the fixing jig of the second modification and the support plate.

Fig. 28 is a cross-sectional view of the fixing jig taken along line 28-28 in Fig. 27.

Fig. 29 is a perspective view showing the fixing jig according to a third modification.

Fig. 30 is a perspective view showing a spacer according to a modification.

Fig. 31 is a diagram showing the spacer of the modification attached to the formwork.

MODES FOR CARRYING OUT THE INVENTION

[0021] A method for constructing a foundation 1 of a building, an anchor support 20, and a formwork set 15 will now be described with reference to Figs. 1 to 21. In the present embodiment, the method for constructing the foundation 1 is applicable to the construction of a mat foundation. The method for constructing the foundation 1 is preferred for a foundation 1 that does not include rising portions (hereinafter referred to as the foundation 1).

[0022] As shown in Figs. 1 and 2, the foundation 1 includes a base 4 and footings 5. The base 4 has a flat upper surface. Some footings 5 are located on a lower part of the outer surface of the base 4. Other footings 5 are located on a lower part of the middle portion of the base 4. Reinforcing bars 6 are arranged in the foundation 1. Anchors 7 are arranged upright on the foundation 1.

[0023] The method for constructing the foundation 1 of the building will now be described with reference to Figs. 3 to 9. Figs. 3 to 9 are diagrams each illustrating a corresponding step in the cross-section taken along line X-X in Fig. 1.

The method for constructing the foundation 1 includes at least first to fifth steps. In the present embodiment, the method for constructing the foundation 1 further includes a sixth step and a seventh step. In the sixth and seventh steps, the footings 5 at the middle portion of the base 4 are formed.

[0024] As shown in Fig. 3, in the first step, a foundation ground 2 on which the foundation 1 is arranged is formed. The foundation ground 2 is formed by grading, excavation of a

trench 2a and a hole 2b, and compaction. The foundation ground 2 is formed to conform to the shape of the foundation 1.

[0025] As shown in Fig. 4, in the second step, the reinforcing bars 6 are placed on the foundation ground 2. The reinforcing bars 6 are arranged along the trench 2a of the foundation ground 2. The reinforcing bars 6 are also arranged on a portion corresponding to the base 4 of the foundation 1. Two reinforcing bars 6 adjacent to each other are coupled together using a binding wire.

[0026] As shown in Fig. 5, in the third step, a formwork 10 that forms the foundation 1 configured to be arranged on the foundation ground 2 is installed. The third step may be performed simultaneously with the second step. In the present embodiment, the formwork 10 includes an outer frame 11 and an inner frame 12. The outer frame 11 is installed to form the outer surface of the foundation 1. The inner frame 12 is located in the outer frame 11. The inner frame 12 is installed to form the footings 5 at the middle portion of the foundation 1. Specifically, the inner frame 12 is arranged along the inner surface of the hole 2b in the foundation ground 2.

[0027] As shown in Fig. 6, in the fourth step, multiple anchors 7 are arranged along the inner surface of the formwork 10. Specifically, the anchors 7 are arranged along the inner surface of the outer frame 11. The fourth step includes a task of installing the anchor support 20. In this task, the anchor support 20 is fixed to the formwork 10 such that a support portion 34 of the anchor support 20 is located at a position higher than the upper end surface 13 of the formwork 10. Then, the anchors 7 are suspended from the anchor support 20. The anchors 7 are supported by the anchor support 20.

[0028] In the fourth step, a first anchor support 21 and a second anchor support 22 are used as the anchor support 20. For example, the first anchor support 21 supports the anchors 7 arranged along a straight section of the formwork 10, which has a length of greater than or

equal to two feet. The second anchor support 22 supports the anchors 7 at positions where the first anchor support 21 cannot be arranged.

[0029] In the present embodiment, the formwork 10 that includes the anchor supports 20 is referred to as the formwork set 15. The formwork set 15 includes the formwork 10 and one or more anchor supports 20. The formwork 10 is formed using a frame plate. The frame plate may be made of wood or metal.

[0030] As shown in Fig. 7, in the fifth step, concrete 8 is placed in the formwork 10. Specifically, the concrete 8 is placed in the space between the outer frame 11 and the inner frame 12. In the fifth step, the concrete 8 is leveled such that the upper surface of the concrete 8 is located at the same height as the upper end surface 13 of the formwork 10. The upper surface of the concrete 8 may be leveled using a leveling material. In the concrete 8 placed in the formwork 10, the upper surface of the concrete 8 is leveled using a trowel at the lower part of the support plate 30 of the first anchor support 21. In the concrete 8 placed in the formwork 10, the upper surface of the concrete 8 is leveled using a trowel at the lower part of the support plate 30 of the second anchor support 22.

[0031] As shown in Fig. 8, in the sixth step, each of the anchors 7 is arranged at a predetermined position in a foundation hole 1a that is formed by the inner frame 12. The sixth step includes a task of installing a third anchor support 23. In this task, the third anchor support 23 is installed on a portion around the foundation hole 1a such that the support portion 34 of the third anchor support 23 is located at a position higher than the upper surface of the surrounding portion of the foundation hole 1a.

[0032] Specifically, reference anchors 9 are each driven into a surrounding portion of the foundation hole 1a at a predetermined position so that the support plate 30 of the third anchor support 23 is arranged with reference to the reference anchors 9. In the sixth step, the support plate 30 of the third anchor support 23 may be arranged with reference to the

anchors 7 arranged along the inner surface of the outer frame 11 (see the long dashed double-short dashed line in Fig. 8). After the installation of the third anchor support 23, the anchors 7 are suspended from the third anchor support 23. The third anchor support 23 supports the anchors 7.

[0033] As shown in Fig. 9, in the seventh step, the concrete 8 is placed in the foundation hole 1a. In this case, the concrete 8 is leveled such that the upper surface of the concrete 8 is located at the same height as the upper surface of the surrounding portion of the foundation hole 1a.

[0034] Anchor Support

The anchor support 20 will now be described with reference to Figs. 10 to 21. The anchor support 20 supports the anchors 7 configured to be arranged on the foundation 1. Various types of anchor supports 20 may be used to construct the foundation 1. A suitable anchor support 20 is used depending on the location where the anchor 7 is arranged upright. In the present embodiment, the anchor support 20 includes the first anchor support 21 (see Fig. 17), the second anchor support 22 (see Figs. 19 and 20), and the third anchor support 23 (see Fig. 8).

[0035] The first anchor support 21 is arranged on a straight section of the formwork 10 that has a length greater than or equal to that of the support plate 30 of the first anchor support 21. The second anchor support 22 is arranged on a portion of the formwork 10 where the first anchor support 21 cannot be arranged. The third anchor support 23 is arranged around the foundation hole 1a.

[0036] First Anchor Support

As shown in Fig. 17, the first anchor support 21 includes the support plate 30, a spacer 31, and a fixing jig 33. The support plate 30 includes support portions 34. Each support portion 34 supports the anchors 7. The support plate 30 is formed using a steel plate.

[0037] As shown in Fig. 10, the support plate 30 includes a reference position 40 of each support portion 34. The reference position 40 is a reference center point of the support portion 34. The support plate 30 includes screw holes 41. The screw holes 41 are arranged at the opposite ends of the support plate 30 in a width direction DW, which is orthogonal to a longitudinal direction DL of the support plate 30. The screw holes 41 are arranged at equal intervals along the edges of the support plate 30 at the opposite ends of the support plate 30 in the width direction DW. The screw holes 41 are arranged with reference to the reference position 40. The screw holes 41 are arranged at the opposite ends of the support plate 30 in the width direction DW at the same pitch.

[0038] The support plate 30 is temporarily fixed to the formwork 10 with screws. The screws are driven into the formwork 10 through the screw holes 41 of the support plate 30, with the spacer 31 located in between. In the temporarily fixed state, the support plate 30 is fixed to the formwork 10 before the support plate 30 is fixed by the fixing jig 33. In the temporarily fixed support plate 30, a first end 30a on one side in the width direction DW is fixed to the formwork 10 with the screws. A second end 30b of the support plate 30 on the other side in the width direction DW is a free end (refer to Fig. 17).

[0039] As shown in Fig. 11, the support plate 30 includes fastening portions 42 to which an arm 61 of the fixing jig 33 is fastened. Each fastening portion 42 includes fastening holes 43 through which bolts are respectively inserted. In the present embodiment, the support plate 30 includes four fastening holes 43. Two of the fastening holes 43 are located relatively near the first end 30a of the support plate 30 on one side in the width direction DW. The other two fastening holes 43 are located relatively near the second end 30b of the support plate 30 on the other side in the width direction DW.

[0040] As shown in Fig. 10, the support plate 30 may include first positioning marks 46. Each first positioning mark 46 is used to position an additional support plate 45. The first

positioning mark 46 is configured to indicate an intermediate position of two support portions 34. For example, the first positioning mark 46 is arranged at the intersection of a median LM, which is equidistant from the reference positions 40 of the two support portions 34, and an edge of the support plate 30 in the width direction DW.

[0041] The support plate 30 may include openings 47. The openings 47 are arranged to reduce the weight of the support plate 30. Each opening 47 is located between two support portions 34 of the support plate 30. For example, the opening 47 is configured to include an intermediate portion of the two support portions 34. This allows the anchors 7 to be inserted through the additional support plate 45 when the additional support plate 45 is arranged at the intermediate portion of the two support portions 34 of the support plate 30.

[0042] The support plate 30 has a predetermined length. For example, the support plate 30 has a length that is greater than or equal to two feet. The first anchor support 21 may include various types of support plates 30, each having a different length. The various support plates 30 each include multiple support portions 34. In the various support plates 30, the distance between the support portions 34 is set to the same predetermined distance DX. The predetermined distance DX is, for example, two feet.

[0043] As shown in Fig. 12, in the formwork 10, various types of support plates 30 or the same type of support plates 30 are arranged such that their support portions 34 overlap each other. Thus, the distance between the support portions 34 is set to the same predetermined distance DX across the support plates 30 that are continuously arranged.

[0044] As shown in Fig. 11, the support portion 34 includes at least one anchor hole 49 through which the anchor 7 is inserted. In the support portion 34, the anchor hole 49 is located at a predetermined position relative to the reference position 40 of the support portion 34. For example, the support portion 34 includes four anchor holes 49. The four

anchor holes 49 are respectively located at positions of the vertices of a square that has the reference position 40 as its center point.

[0045] The support portion 34 includes viewing holes 50. Each viewing hole 50 is configured to allow the anchor 7 to be seen with the anchor 7 inserted through a corresponding anchor hole 49. The viewing hole 50 is located relatively near the anchor hole 49.

[0046] The support portion 34 includes marks 51 that are used to position the support portion 34 relative to the reference of the foundation 1. Each mark 51 is arranged with reference to the reference position 40 of the support portion 34. For example, the mark 51 is formed as a cutout in the edge of the support plate 30. The mark 51 may be formed on the support plate 30 as a groove, a recess, or a projection.

[0047] The reference of the foundation 1 is set using a reference string (leveling string) configured to be stretched on the foundation ground 2. During arrangement of the first anchor support 21, the position of the support plate 30 is adjusted such that the marks 51 of the support portion 34 of the support plate 30 extend along the reference string. After the support plate 30 is arranged at a predetermined position, the support plate 30 is temporarily fixed to the formwork 10 using screws.

[0048] The same support portions 34 are used for various types of anchor supports 20. Specifically, the support portions 34 of the first anchor support 21, the second anchor support 22, and the third anchor support 23 have the same structure.

[0049] Referring to Fig. 13, the first anchor support 21 may include the additional support plate 45. The additional support plate 45 is used to add the support portion 34 to the support plate 30. The additional support plate 45 includes a support portion 34 that has the same structure as the support portion 34 of the support plate 30. Specifically, the additional support plate 45 includes the support portion 34 having the same structure as the support

portion 34 of the support plate 30 regarding the positional relationship between the reference position 40 and the anchor holes 49.

[0050] The additional support plate 45 includes screw holes 41. The pitch of each screw hole 41 is equal to the pitch of the screw hole 41 of the support plate 30. The screw holes 41 are arranged with reference to the reference position 40 of the support portion 34. The additional support plate 45 includes second positioning marks 53. Each second positioning mark 53 is arranged at the intersection of a line that extends through the reference positions 40 of the support portion 34 in the width direction DW and an edge of the support plate 30 in the width direction DW.

[0051] As shown in Fig. 14, when the additional support plate 45 is arranged on the support plate 30, the additional support plate 45 is positioned relative to the support plate 30 such that the second positioning marks 53 of the additional support plate 45 are respectively aligned with the first positioning marks 46 of the support plate 30. After the additional support plate 45 is positioned relative to the support plate 30, the additional support plate 45 is fixed to the formwork 10 using screws. In this manner, an additional support portion 34 can be arranged at the intermediate position between two support portions 34 of the support plate 30.

[0052] The fixing jig 33 will now be described with reference to Fig. 15. The fixing jig 33 fixes the support plate 30 to the formwork 10. The fixing jig 33 supports the support plate 30 that is arranged on the formwork 10, with the spacer 31 located between the support plate 30 and the formwork 10 (see Fig. 17).

[0053] The fixing jig 33 includes a body 60 and the arm 61. The body 60 and the arm 61 are made of iron. The body 60 and the arm 61 may be made of aluminum alloy. The arm 61 is fixed to the body 60 through welding or fastening.

[0054] The body 60 is arranged along an outer surface 11a of the formwork 10 and fixed to the formwork 10 (see Fig. 17). The body 60 includes a plate 60a that is in contact with the outer surface 11a of the formwork 10 and reinforcement portions 60b that reinforce the plate 60a. The plate 60a extends in its vertical direction with the fixing jig 33 fixed to the formwork 10. The reinforcement portions 60b are arranged at the opposite ends of the plate 60a in its width direction, which intersects the vertical direction. The reinforcement portions 60b project in a direction opposite to the direction in which the arm 61 projects. The reinforcement portions 60b extend in the vertical direction along the edge of the plate 60a. The plate 60a is formed integrally with the reinforcement portions 60b.

[0055] The arm 61 supports the support plate 30. The arm 61 extends from the body 60. The arm 61 extends from the body 60 in a direction orthogonal to the vertical direction. The arm 61 includes a base portion 62 configured to be connected to the body 60 and a distal end 63 that is located on a side opposite to the base portion 62. The arm 61 has the form of a plate. The arm 61 may be supported by the reinforcing support portion 64. The reinforcing support portion 64 connects the upper surface of the base portion 62 of the arm 61 to the upper part of the body 60. The upper part of the body 60 refers to a part of the body 60 that is above the part to which the arm 61 is connected.

[0056] The arm 61 includes fastening portions 65 to which the support plate 30 is fastened. Each fastening portion 65 includes a fastening hole 66 through which a bolt is inserted. In the present embodiment, the arm 61 includes four fastening holes 66. Two of the fastening holes 66 are arranged relatively near the base portion 62 of the arm 61. The other two fastening holes 66 are located relatively near the distal end 63 of the arm 61.

[0057] As shown in Fig. 18, the arm 61 is arranged in the width direction DW of the support plate 30. The base portion 62 of the arm 61 supports the first end 30a of the support plate 30 on one side in the width direction DW. The distal end 63 of the arm 61 supports the

second end 30b of the support plate 30 on the other side in the width direction DW. The structure in which the base portion 62 of the arm 61 supports the first end 30a of the support plate 30 may be omitted.

[0058] As shown in Fig. 17, the spacer 31 is located between the end of the support plate 30 and the upper end surface 13 of the formwork 10. The spacer 31 positions the support plate 30 in a height direction relative to the formwork 10 of the foundation 1. The spacer 31 has a predetermined thickness. The spacer 31 is sized so as to be arranged on the formwork 10. For example, the width of the spacer 31 is equal to the width of the formwork 10. For example, the spacer 31 has the form of a rectangular prism or a cube. The spacer 31 is a member into which a screw can be driven. For example, the spacer 31 is made of wood or resin. As shown in a modification that will be described later, the spacer 31 may be made of sheet metal.

[0059] In the temporarily fixed state of the support plate 30, the spacer 31 is spaced apart from the upper end surface 13 of the formwork 10. The spacer 31 may be fixed to the formwork 10 using adhesive. The support plate 30 is arranged such that the first end 30a of the support plate 30 on one side in the width direction DW is placed on multiple spacers 31. In this manner, the support plate 30 is positioned relative to the upper end surface 13 of the formwork 10 in the height direction.

[0060] The anchors 7 are arranged in the method for constructing the foundation 1 in the following manner. The spacer 31 is arranged on the upper end surfaces 13 of the formwork 10. The support plate 30 is arranged such that the first end 30a of the support plate 30 is placed on the spacers 31. Further, the support plate 30 is temporarily fixed to the formwork 10 with screws.

[0061] As shown in Fig. 16, the support plates 30 are arranged along the inner surface of the formwork 10. Adjacent ones of the support plates 30 are arranged such that their support

portions 34 overlap each other. After the support plates 30 are arranged, each support plate 30 is fixed to the formwork 10 using the fixing jig 33 with the first end 30a of the support plate 30 on one side in the width direction DW placed on the spacer 31. Specifically, the body 60 is fixed to the formwork 10 with the body 60 of the fixing jig 33 in contact with the outer surface 11a of the formwork 10 and the arm 61 in contact with the upper surface of the support plate 30. Further, the arm 61 and the support plate 30 are fastened to each other using bolts. The support plate 30 of the first anchor support 21 is located at a predetermined height from the upper end surface 13 of the formwork 10. The anchors 7 are attached to the support plate 30 that has been fixed in this manner.

[0062] Second Anchor Support

The second anchor support 22 will now be described with reference to Figs. 19 and 20. The second anchor support 22 supports the anchors 7 arranged on the foundation 1. The second anchor support 22 includes the support portion 34, a fixed portion 70 configured to be fixed to the formwork 10, and a coupling portion 71 that couples the support portion 34 to the fixed portion 70. The coupling portion 71 couples the support portion 34 to the fixed portion 70 such that the support portion 34 is located at a position from the fixed portion 70 by a predetermined height with the fixed portion 70 arranged horizontally. The distance between the lower surface of the support portion 34 and the lower surface of the fixed portion 70 is equal to the thickness of the spacer 31 of the first anchor support 21.

[0063] The fixed portion 70 of the second anchor support 22 is fixed to the upper end surface 13 of the formwork 10.

The second anchor support 22 is used to arrange the anchors 7 at positions of the formwork 10 where the first anchor support 21 cannot be installed.

[0064] The second anchor support 22 has two types of forms depending on the position where the second anchor support 22 is installed. Specifically, the second anchor support 22

includes a fourth anchor support 24 and a fifth anchor support 25. The fifth anchor support 25 is formed by coupling two fourth anchor supports 24 to each other.

[0065] As shown in Fig. 19, the fourth anchor support 24 includes a support plate 30 having one support portion 34, the fixed portion 70, which is configured to be fixed to the formwork 10, and the coupling portion 71, which couples the support portion 34 to the fixed portion 70.

[0066] As shown in Fig. 21, the fourth anchor support 24 is arranged at a portion of the formwork 10 where the straight-line distance is shorter than two feet. Two or more fourth anchor supports 24 may be continuously arranged.

[0067] As shown in Fig. 20, the fifth anchor support 25 includes a support plate 30 having two support portions 34, the fixed portion 70, which is configured to be fixed to the formwork 10, and the coupling portion 71, which couples the support portion 34 to the fixed portion 70.

[0068] As shown in Fig. 21, the fifth anchor support 25 is installed at an outside corner of the formwork 10. The fifth anchor support 25 is fixed to the formwork 10 such that one of the two support portions 34 is located at a diagonal position corresponding to the outside corner.

[0069] In the arrangement of the anchors 7 in the method for constructing the foundation 1, the fourth anchor support 24 and the fifth anchor support 25 are used as follows. In the fourth step, the fixed portion 70 of the fourth anchor support 24 is fixed to the upper end surface 13 of the formwork 10. This causes the support plate 30 of the fourth anchor support 24 to be fixed at the predetermined height from the upper end surface 13 of the formwork 10. The anchors 7 are attached to the support plate 30.

[0070] Half of the fixed portion 70 of the fifth anchor support 25 is arranged at the outside corner of the formwork 10 to fix the fixed portion 70 to the upper end surface 13 of the

formwork 10. As a result, the support plate 30 of the fifth anchor support 25 is fixed at the predetermined height from the upper end surface 13 of the formwork 10, with one of the two support portions 34 located at a diagonal position corresponding to the outside corner. The anchors 7 are attached to the support plate 30.

[0071] Third Anchor Support

The third anchor support 23 supports the anchors 7 arranged in the foundation hole 1a. The third anchor support 23 includes the support plate 30 having one or more support portions 34, the reference anchors 9, and spacers 75. The reference anchors 9 are arranged around the foundation hole 1a of the foundation 1, which includes the foundation hole 1a. The reference anchors 9 are each arranged at a predetermined position with respect to the foundation hole 1a. The spacers 75 are arranged around the foundation hole 1a of the foundation 1 (refer to Fig. 8). Each spacer 75 may have a hole through which a corresponding reference anchor 9 is inserted. The thickness of the spacer 75 of the third anchor support 23 is equal to the thickness of the spacer 31 of the first anchor support 21. The support plate 30 is mounted on the spacers 75 and engaged with the reference anchors 9.

[0072] In the arrangement of the anchors 7 in the method for constructing the foundation 1, the third anchor support 23 is used as follows. In the sixth step, the reference anchors 9 are each driven into the surrounding portion of the foundation hole 1a at a predetermined position. The spacers 75 are arranged on the foundation 1 to be respectively engaged with the reference anchors 9. The support plate 30 is arranged with reference to the reference anchors 9. Specifically, the support plate 30 is arranged on the foundation 1 such that the reference anchors 9 are respectively inserted through other anchor holes 49 of the support plate 30. The other anchor holes 49 are anchor holes 49 excluding the anchor holes 49 that are respectively used to support the anchors 7 arranged in the foundation hole 1a. The support plate 30 is placed on the spacers 75. As a result, the support plate 30 is located at a

predetermined height from the upper surface of the foundation 1 (refer to Fig. 8). The anchors 7 are attached to the support plate 30 that has been arranged in this manner. The anchors 7 attached to the support plate 30 are each located at the predetermined position with respect to the foundation hole 1a.

[0073] The operation of the present embodiment will now be described.

In conventional construction of the foundation 1, the foundation 1 is formed such that the upper surface of the foundation 1 is located at a lower position than the upper end surface 13 of the formwork 10. In the foundation 1 without rising portions, the upper surface of the foundation 1 is relatively broad. This makes it difficult to confirm that the height of the upper surface of a portion relatively far from the formwork 10 is a predetermined height. In the present embodiment, when the concrete 8 is placed, the concrete 8 is leveled such that the upper surface of the concrete 8 is located at the same height as the upper end surface 13 of the formwork 10. In correspondence with the upper surface of the concrete 8, the height of the formwork 10 is set to be the same as the height of the formwork 10. This allows for quick confirmation of whether the height of the upper surface of a portion relatively far from the formwork 10 and the height of the upper end surface 13 of a portion relatively close to the formwork 10 match the height of the upper end surface 13 of the formwork 10.

[0074] The advantages of the method for constructing the foundation 1 of the building according to the present embodiment will now be described.

(1) In the method for constructing the foundation 1 of the building, when the concrete 8 is placed, the concrete 8 is leveled such that the upper surface of the concrete 8 is located at the same height as the upper end surface 13 of the formwork 10.

[0075] This configuration allows the concrete 8 to be leveled with reference to the upper end surface of the formwork 10. Thus, the task of leveling the concrete 8 is facilitated.

Accordingly, the upper surface of the foundation 1 is readily formed to be flat at a predetermined height.

[0076] (2) In the method for constructing the foundation 1 of the building, the anchor support 20 is fixed to the formwork 10 such that the support portion 34 of the anchor support 20 is located at a position higher than the upper end surface 13 of the formwork 10. The anchor support 20 fixed in this manner are used to support the anchors 7.

[0077] In this configuration, the support portion 34 is located at a higher position than the upper end surface 13 of the formwork 10. This allows the concrete 8 to be leveled such that the upper surface of the concrete 8 is located at the same height as the upper end surface 13 of the formwork 10.

[0078] (3) In the method for constructing the foundation 1 of the building, the spacer 31 is arranged on the upper end surface 13 of the formwork 10, and the support plate 30 is fixed to the formwork 10 using the fixing jig 33 with the end of the support plate 30 placed on the spacer 31. In this configuration, the support plate 30 is fixed to the formwork 10 using the spacers 31. This allows the support plate 30 to be readily arranged at a predetermined height from the upper end surface 13 of the formwork 10.

[0079] (4) In the method for constructing the foundation 1 of the building, the fixed portion 70 of the second anchor support 22 is fixed to the upper end surface 13 of the formwork 10. This configuration allows the support portion 34 to be readily located at the predetermined height from the upper end surface 13 of the formwork 10 without using the spacer 31.

[0080] (5) In the method for constructing the foundation 1 of the building, the concrete 8 is placed in the foundation hole 1a, and the concrete 8 is leveled such that the upper surface of the concrete 8 is located at the same height as the upper surface of the surrounding portion of the foundation hole 1a.

[0081] In this configuration, it is difficult to level the concrete 8 such that the upper surface of the concrete 8 placed in the foundation hole 1a is located at a lower predetermined height than the upper surface of the surrounding portion of the foundation hole 1a. In the above configuration, the concrete 8 is leveled such that the upper surface of the concrete 8 is located at the same height as the upper surface of the surrounding portion of the foundation hole 1a. This facilitates the task of leveling the concrete 8.

[0082] (6) In the method for constructing the foundation 1 of the building, the support plate 30 is arranged such that the support plate 30 is located at a higher position than the upper surface of the foundation 1 when the anchors 7 are each located at a predetermined position in the foundation hole 1a. In this configuration, the support plate 30 is located at a higher position than the upper surface of the foundation 1. This facilitates the task of leveling the concrete 8 such that the upper surface of the concrete 8 placed in the foundation hole 1a is located at the same height as the upper surface of the surrounding portion of the foundation hole 1a.

[0083] (7) In the method for constructing the foundation 1 of the building, when the anchors 7 are each located at a predetermined position in the foundation hole 1a, the reference anchors 9 are each driven into the surrounding portion of the foundation hole 1a at a predetermined position. Further, the support plate 30 is arranged with reference to the reference anchor 9. In this configuration, the support plate 30 is located at a predetermined position relative to the foundation hole 1a. This allows the anchors 7 supported by the support plate 30 to be accurately located relative to the foundation hole 1a.

[0084] (8) In the method for constructing the foundation 1 of the building, the support plate 30 may be arranged with reference to the anchors 7 arranged along the inner surface of the outer frame 11 (see the long dashed double-short dashed line in Fig. 8). In this configuration, the support plate 30 is located at a predetermined position with respect to the anchors 7

located along the outer frame 11. This allows the anchors 7 supported by the support plate 30 to be accurately located relative to the anchors 7 located along the outer frame 11.

[0085] The advantages of the first anchor support 21 and the formwork set 15 of the present embodiment will now be described.

(1) The anchor support 20 includes the support plate 30, the spacer 31, which positions the support plate 30 in the height direction relative to the formwork 10 of the foundation 1, and the fixing jig 33, which fixes the support plate 30 to the formwork 10. The fixing jig 33 supports the support plate 30 that is arranged on the formwork 10 with the spacer 31 located in between. The fixing jig 33 supports the support plate 30, with the support plate 30 arranged on the formwork 10 using the spacer 31.

[0086] If the support plate 30 is fixed to the formwork 10 only using a screw and the anchors 7 are attached to the support plate 30, the weights of the anchors 7 may cause the support plate 30 to flex. This lowers the position accuracy of the anchors 7. In this respect, the support plate 30 is supported by the fixing jig 33 and fixed to the formwork 10. When the anchors 7 are attached to the support plate 30, the load on the anchors 7 is applied to the fixing jig 33. This limits flexing of the support plate 30. As a result, the position accuracy of the anchors 7 is improved in the foundation 1.

[0087] (2) The fixing jig 33 includes the body 60, which is configured to be arranged along the outer surface 11a of the formwork 10 and fixed to the formwork 10, and the arm 61, which extends from the body 60 to support the support plate 30.

[0088] In this configuration, the support plate 30 is supported by the arm 61 extending from the body 60, which is configured to be fixed to the formwork 10. The arm 61 supports a portion of the support plate 30 that is separated from the formwork 10. This limits flexing of the support plate 30 in the direction that is orthogonal to an inner surface 11b of the formwork 10. This improves the position accuracy of the anchors 7.

[0089] The support plate 30 may be supported by multiple fixing jigs 33. For example, the fixing jigs 33 are spaced apart from each other in the longitudinal direction DL of the support plate 30 (see Fig. 16). Since the support plate 30 is supported by the fixing jigs 33, flexing of the support plate 30 in the longitudinal direction DL is limited. Further, the support plate 30 is supported by the arms 61 of the fixing jigs 33. This limits the flexing of the support plate 30 in the width direction DW even when the anchors 7 are attached to the support plate 30.

[0090] (3) The arm 61 of the fixing jig 33 includes the fastening portion 65, to which the support plate 30 is fastened. In this configuration, the support plate 30 is firmly fixed to the arm 61. This limits situations in which the support plate 30 is detached from the arm 61 by shaking of the foundation ground 2.

[0091] (4) Each support portion 34 of the support plate 30 includes at least one anchor hole 49, through which the anchor 7 is inserted. In the support portion 34, the anchor hole 49 is located at a predetermined position relative to the reference position 40 of the support portion 34. In this configuration, each anchor 7 is located at a predetermined position on the support plate 30. Thus, the anchor 7 is arranged at a predetermined position with respect to the foundation ground 2 simply by arranging the support plate 30 at a predetermined position relative to the foundation ground 2 and inserting the anchor 7 into the anchor hole 49.

[0092] (5) The support plate 30 includes multiple support portions 34. In the support plate 30, the support portions 34 are spaced apart from each other by the predetermined distance DX. This configuration allows multiple anchors 7 to be each located at a predetermined position relative to the foundation ground 2 using a single support plate 30.

[0093] The first anchor support 21 may include various types of support plates 30, each having a different length. This allows for a greater variation in locations where the first

anchor support 21 can be installed. In each type of the support plates 30, the distance between the support portions 34 is set to the same predetermined distance DX.

[0094] Each type of the support plates 30 includes the support portion 34 having the same structure. In this configuration, when different types of support plates 30 are combined or when the same type of support plates 30 are combined, the support portions 34 of adjacent two support plates 30 are overlapped with each other so that the distance between the support portions 34 is set to the same predetermined distance DX across the support plates 30 that are continuously arranged. In this manner, each anchor 7 is arranged at a predetermined pitch. The support plate 30 has a function similar to a ruler, allowing for the placement of the anchor 7 at a predetermined pitch. The use of such a support plate 30 allows each anchor 7 to be readily arranged at a predetermined position.

[0095] (6) The anchor support 20 may include the additional support plate 45. The additional support plate 45 includes the support portion 34, which has the same structure as the support portion 34 of the support plate 30. This configuration allows the number of the anchors 7 supported by a single support plate 30 to be increased as necessary.

[0096] (7) In the first anchor support 21, the support portion 34 may include the mark 51, which is used to position the support portion 34 relative to the reference of the foundation 1. In this configuration, the mark 51 is aligned with the reference of the foundation 1 so that the support portion 34 is accurately located relative to the reference of the foundation 1.

[0097] (8) The formwork set 15 includes the anchor support 20. The formwork set 15 includes the anchor support 20 and thus limits flexing of the support plate 30. As a result, the position accuracy of the anchors 7 is improved in the foundation 1.

[0098] The advantages of the second anchor support 22 of the present embodiment will now be described.

(1) The second anchor support 22 includes the support portion 34, which supports the anchors 7, the fixed portion 70, which is configured to be fixed to the formwork 10 of the foundation 1, and the coupling portion 71. The coupling portion 71 couples the support portion 34 to the fixed portion 70 such that the support portion 34 is located at a predetermined height from the fixed portion 70 with the fixed portion 70 arranged horizontally.

[0099] In this configuration, when the fixed portion 70 is fixed to the formwork 10 of the foundation 1, the support portion 34 is located at a higher position than the upper end surface 13 of the formwork 10. This allows the concrete 8 to be leveled such that the upper surface of the concrete 8 is located at the same height as the upper end surface 13 of the formwork 10. The upper surface of the concrete 8 does not include a portion concealed by the formwork 10. This allows the entire upper surface of the concrete 8 to be seen and thus facilitates the task of leveling the concrete 8. Accordingly, the upper surface of the foundation 1 is readily formed to be flat at a predetermined height.

[0100] (2) In the second anchor support 22, the support portion 34 includes the mark 51, which is used to position the support portion 34 relative to the reference of the foundation 1. In this configuration, the mark 51 is aligned with the reference of the foundation 1 so that the support portion 34 is accurately located relative to the reference of the foundation 1.

[0101] The advantage of the third anchor support 23 of the present embodiment will now be described.

The third anchor support 23 includes the support plate 30, which includes the support portion 34, and the spacers 75. The spacers 75 are arranged around the foundation hole 1a of the foundation 1. The support plate 30 is placed on the spacers 75 to extend across the foundation hole 1a. Further, the support plate 30 is positioned by the reference anchors 9 or other anchors 7. The other anchors 7 are the anchors 7 of the foundation 1 including the

foundation hole 1a. This configuration allows the support plate 30 of the third anchor support 23 to be positioned at a predetermined height from the upper surface of the surrounding portion of the foundation hole 1a. Accordingly, the concrete 8 is leveled such that the upper surface of the concrete 8, with which the foundation hole 1a is filled, is located at the same height as the upper surface of the surrounding portion of the foundation hole 1a.

[0102] Modifications

The above embodiment exemplifies, without any intention to limit, applicable forms of the anchor support 20, the formwork set 15, and the method for constructing the foundation 1. The anchor support 20, the formwork set 15, and the method for constructing the foundation 1 may each take a form different from that illustrated in the embodiment. For example, some of the components of the embodiment may be replaced, changed, or omitted. Alternatively, new components may be added to the embodiment. Modifications of the embodiment will now be described. In the modifications, the same reference characters are given to those components that are the same as the corresponding components of the above embodiment. Such components will not be described.

[0103] A first modification of the fixing jig 33 will now be described with reference to Figs. 22 and 23.

The joining structure between the arm 61 and the support plate 30 of a fixing jig 33A may be modified as follows. In the embodiment, the support plate 30 is fixed to the arm 61 by fastening the fastening portions 65 of the arm 61 and the fastening portions 42 of the support plate 30 to each other. In this modification, the distal end 63 of the arm 61 of the fixing jig 33A is configured to be engaged with the second end 30b of the support plate 30 on the side opposite to the first end 30a, which is configured to be fixed to the formwork 10.

[0104] The arm 61 is configured such that the distal end 63 is located at a lower position than the base portion 62. Specifically, the arm 61 includes a step 80 between the base portion 62 and the distal end 63. The step 80 is configured such that the distal end 63 is located at a lower position than the base portion 62. The step 80 is configured such that the distance between the lower surface of the base portion 62 of the arm 61 and the upper surface of the distal end 63 is equal to the thickness of the support plate 30. When the support plate 30 is attached to the arm 61, the base portion 62 of the arm 61 is arranged to contact the upper surface of the support plate 30, and the distal end 63 of the arm 61 is arranged to contact the lower surface of the support plate 30. The first end 30a of the support plate 30 on one side in the width direction DW is supported by the formwork 10. The second end 30b of the support plate 30 on the other side in the width direction DW is supported by the distal end 63 of the arm 61 from below. The second end 30b of the support plate 30 may be secured to the distal end 63 of the arm 61 using a clip 81 such that the second end 30b of the support plate 30 is not displaced from the distal end 63 of the arm 61.

[0105] The second end 30b of the support plate 30 may be secured to the distal end 63 of the arm 61 in any manner.

Referring to Fig. 24, a bolted clip 82 may be used to secure the second end 30b of the support plate 30 to the distal end 63 of the arm 61. The second end 30b of the support plate 30 is firmly fixed to the distal end 63 of the arm 61 by tightening the bolt.

[0106] Referring to Fig. 25, the bolted clip 82 may have a threaded portion 83 that supports the bolt. The threaded portion 83 is joined to the clip body 82a. The threaded portion sustains the tightening force of the bolt.

[0107] A second modification of the fixing jig 33 will now be described with reference to Figs. 26, 27, and 28. The joining structure between the arm 61 and the support plate 30 of a fixing jig 33B may be modified as follows. The structure of the arm 61 of the fixing jig 33B

is not changed from that of the arm 61 of the embodiment. In the above embodiment, the support plate 30 is fixed to the arm 61 by fastening the fastening portions 65 of the arm 61 and the fastening portions 42 of the support plate 30 to each other.

[0108] In this modification, the fastening portions 65 of the arm 61 are fastened to portions of the support plate 30 other than the fastening portions 42. Specifically, an engagement member 90 is used to secure the distal end 63 of the arm 61 of the fixing jig 33B to the second end 30b of the support plate 30 on the side opposite to the first end 30a, which is configured to be fixed to the formwork 10.

[0109] The engagement member 90 includes bolts 91, spacers 92 configured to be arranged in the opening 47 of the support plate 30, and a plate 93 that has fastening holes 93a. Each spacer 92 includes a recess 92a. To fix the support plate 30 to the arm 61 of the fixing jig 33B, the arm 61 is arranged above the support plate 30 to overlap the opening 47 of the support plate 30. The plate 93 is arranged below the arm 61, with the support plate 30 located in between. The support plate 30 is held between the arm 61 and the plate 93. The thickness of each spacer 92 is equal to the thickness of the support plate 30. The spacer 92 is arranged at a portion of the opening 47 of the support plate 30 that is located between the arm 61 and the plate 93. The support plate 30 is fixed to the arm 61 by respectively inserting the bolts 91 through the fastening holes 66 of the arm 61, the fastening holes 93a of the plate 93, and the recesses 92a of the spacers 92 and fastening nuts configured to be engaged with the bolts 91 (refer to Fig. 28).

[0110] A third modification of the fixing jig 33 will now be described with reference to Fig. 29.

As shown in Fig. 29, a fixing jig 33C includes a metal fitting 95 at the distal end 63. The metal fitting 95 is used to fix the second end 30b of the support plate 30 to the distal end 63 of the arm 61. The metal fitting 95 is rotationally provided on the arm 61. The metal fitting

95 includes a metal fitting body 96 and a lever 97 that rotates the metal fitting body 96. The metal fitting body 96 includes a shaft 96a and a hook 96b that is orthogonal to the shaft 96a. The metal fitting body 96 is rotated such that the hook 96b does not get caught on the second end 30b of the support plate 30. In this state, the metal fitting body 96 is inserted through the opening 47 of the support plate 30 so that the support plate 30 is arranged below the arm 61. With the support plate 30 arranged below the arm 61, the metal fitting 95 is rotated to engage the hook 96b with the second end 30b of the support plate 30. In this manner, the second end 30b of the support plate 30 is fixed to the distal end 63 of the arm 61.

[0111] In this configuration, when the support plate 30 is supported by the fixing jig 33C, the fixing jig 33C is readily engaged with the support plate 30 using the engagement member 90. This allows the support plate 30 to be arranged in the formwork 10 efficiently.

[0112] A modification of the spacer 31 will now be described with reference to Figs. 30 and 31.

Referring to Figs. 30 and 31, a spacer 100 may be attachable to and detachable from the formwork 10. For example, the spacer 100 includes a spacer body 101 and two legs 102 that extend from the spacer body 101. The two legs 102 extend downward from the lower surface of the spacer body 101. The distance between the two legs 102 is equal to the width of the formwork 10. The spacer body 101 includes an insertion hole 103 through which a screw is inserted. The spacer 100 is made of, for example, sheet metal. In this configuration, the spacer 100 is attachable to and detachable from the formwork 10, and includes the insertion hole 103, through which the screw is inserted. This reduces the deformation of the spacer 100 due to the driving of the screw, allowing the spacer 100 to be used repeatedly.

REFERENCE SIGNS LIST

[0113] 1) Foundation; 1a) Foundation Hole; 2) Foundation Ground; 5) Footing; 6) Reinforcing Bar; 7) Anchor; 8) Concrete; 9) Reference Anchor; 10) Formwork; 11) Outer

Frame; 12) Inner Frame; 13) Upper End Surface; 20) Anchor Support; 21) First Anchor Support; 22) Second Anchor Support; 23) Third Anchor Support; 30) Support Plate; 31) Spacer; 33, 33A, 33B, 33C) Fixing Jig; 34) Support Portion; 51) Mark 70) Fixed Portion; 71) Coupling Portion

CLAIMS

[Claim 1] A method for constructing a foundation of a building, the method comprising:

a first step that forms a foundation ground;

a second step that installs a reinforcing bar on the foundation ground;

a third step that installs a formwork, the formwork forming the foundation configured to be arranged on the foundation ground;

a fourth step that arranges anchors along an inner surface of the formwork; and

a fifth step that places concrete in the formwork,

wherein, in the fifth step, the concrete is leveled such that an upper surface of the concrete is located at the same height as an upper end surface of the formwork.

[Claim 2] The method according to claim 1, wherein

the fourth step includes a task of installing an anchor support such that at least one of the anchors is supported by the anchor support, the anchor support including a support portion that supports the at least one of the anchors, and

in the task, the anchor support is fixed to the formwork such that the support portion is located at a higher position than the upper end surface of the formwork.

[Claim 3] The method according to claim 2, wherein

the anchor support includes a first anchor support,

the first anchor support includes

a support plate including the support portion;

a fixing jig that fixes the support plate to the formwork; and

a spacer configured to be arranged between an end of the support plate and the upper end surface of the formwork, and

in the fourth step, the spacer is arranged on the upper end surface of the formwork and the support plate is fixed to the formwork using the fixing jig with the end of the support plate placed on the spacer.

[Claim 4] The method according to claim 2 or 3, wherein

the anchor support includes a second anchor support,

the second anchor support includes:

the support portion;

a fixed portion configured to be fixed to the formwork; and

a coupling portion that couples the support portion to the fixed portion such that the support portion is located at a predetermined height from the fixed portion with the fixed portion arranged horizontally, and

in the fourth step, the fixed portion of the second anchor support is fixed to the upper end surface of the formwork.

[Claim 5] The method according to any one of claims 1 to 4, further comprising a sixth step and a seventh step that are performed after the fifth step, wherein

in the third step, an outer frame and an inner frame are installed as the formwork, the outer frame forming an outer surface of the foundation, the inner frame forming a footing at a middle portion of the foundation,

in the fourth step, the anchors are arranged along an inner surface of the outer frame,

in the fifth step, the concrete is placed in a space between the outer frame and the inner frame,

in the sixth step, the anchors are each located at a predetermined position in a foundation hole formed by the inner frame, and

in the seventh step, the concrete is placed in the foundation hole and leveled such that an upper surface of the concrete is located at the same height as an upper surface of a surrounding portion of the foundation hole.

[Claim 6] The method according to claim 5, wherein

the sixth step includes a task of installing a third anchor support such that the at least one of the anchors is supported by the third anchor support, the third anchor support including a support plate that supports the at least one of the anchors, and

in the task of the sixth step, the third anchor support is installed on a portion around the foundation hole such that the support plate is located at a higher position than the upper surface of the surrounding portion of the foundation hole.

[Claim 7] The method according to claim 6, wherein, in the sixth step, a reference anchor is driven into the surrounding portion of the foundation hole at a predetermined position and the support plate is arranged with reference to the reference anchor.

[Claim 8] The method according to claim 6, wherein, in the sixth step, the support plate is arranged with reference to the anchors that are arranged along the inner surface of the outer frame.

[Claim 9] An anchor support that supports an anchor configured to be arranged on a foundation, the anchor support comprising:

a support portion that supports the anchor;

a fixed portion configured to be fixed to a formwork of the foundation; and

a coupling portion that couples the support portion to the fixed portion such that the support portion is located at a predetermined height from the fixed portion with the fixed portion arranged horizontally,

wherein the support portion includes a mark used to position the support portion relative to a reference of the foundation.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2021/020713

A. CLASSIFICATION OF SUBJECT MATTER
E02D 27/00(2006.01)i
FI: E02D27/00 B

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
E02D27/00

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Published examined utility model applications of Japan	1922-1996
Published unexamined utility model applications of Japan	1971-2021
Registered utility model specifications of Japan	1996-2021
Published registered utility model applications of Japan	1994-2021

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	JP 2018-199946 A (SEKISUI HOUSE KK) 20 December 2018 (2018-12-20) paragraphs [0019]-[0022], fig. 7-12	1-9
A	Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 024505/1978 (Laid-open No. 128304/1979) (NATIONAL HOUSING MATERIALS CO., LTD.) 06 September 1979 (1979-09-06) entire text, all drawings	1-9

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
30 July 2021 (30.07.2021)	24 August 2021 (24.08.2021)

Name and mailing address of the ISA/	Authorized officer
Japan Patent Office 3-4-3, Kasumigaseki, Chiyoda-ku, Tokyo 100-8915, Japan	Telephone No.

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/JP2021/020713

Patent Documents referred in the Report	Publication Date	Patent Family	Publication Date
JP 2018-199946 A	20 Dec. 2018	(Family: none)	
JP 54-128304 U1	06 Sep. 1979	(Family: none)	