[FIG. 22] This is a cross-sectional view of the support mechanism, illustrating a state in which the restricting protrusion has released restricting movement by the grasping attachment.

[FIG. 23] This is an explanatory view for a usage state for the grasping attachment unit which is mounted to the pile press-in device.

DESCRIPTION OF EMBODIMENTS

[0011] Hereinafter, one embodiment of the present invention will be described with reference to the drawings. The following is one embodiment of the present invention and does not limit the present invention.

[0012]

[Performing Pile Press-in Construction Method (1)]

FIG. 1 through FIG. 7B illustrate a situation for performing a pile press-in construction method using a pile press-in device according to one embodiment of the present invention. FIG. 1 through FIG. 4 illustrate, by four scenes, an operation by a pile press-in device in a pile supplying step. FIG. 5A, FIG. 5B, FIG. 6A, and FIG. 6B illustrate two scenes in a situation for performing the method at a site having height limitations. FIG. 7A and FIG. 7B illustrate a situation for performing the method above a water surface having height limitations. Three orthogonal axes XYZ are illustrated in the drawings by taking a

left-right direction axis as an X axis, a forward-rearward directional axis as a Y axis, and an up-down directional axis as a Z axis, in order to clarify directions.

Note that, in the following description, an "existing pile" refers to a pile for which pressing-in has already finished and no further press-in operation will be performed, regardless of pile type. In addition, a "press-in pile" refers to a pile for which pressing-in is to be performed or which is partway through pressing-in, regardless of pile type.

In the case of divided piles that configure an articulated pile by means of longitudinal joining, a divided pile which is in a state of being pressed into the ground, is scheduled to be connected by longitudinal joining to a new divided pile, and to which a press-in operation is to be applied as well as a divided pile in a state of being grasped by a chuck device 6 belonging to a pile press-in device 10 both correspond to a "press-in pile".

Longitudinal joining refers to connecting ends of a plurality of piles, which are disposed in-line while being aligned in the longitudinal direction, with one another.

[0013] The pile press-in device 10 is provided with a saddle 1, a plurality of clamp devices 2F and 2R that grasp upper ends of existing piles P1-P4, ... pressed in to the ground and are provided at the bottom of the saddle 1, a slide base 3 that is provided so as to be able to move

CLAIMS

[Claim 1]

A pile press-in construction method using a pile press-in device that is provided with a saddle, a clamp device that is provided at the bottom of the saddle and grasps an upper end of an existing pile that has been pressed into the ground, a mast erected in a turnable manner on the saddle, a raising and lowering device, and a chuck device that is supported by the mast via the raising and lowering device and holds a pile, the pile press-in device generating a reaction force by griping, with the clamp device, the upper end of the existing pile that has been pressed into the ground, holding the pile by the chuck device, pressing the pile into the ground by operating the raising and lowering device, and successively pressing in piles while moving on a pile row including the existing pile to thereby extend the pile row on the ground,

the pile press-in construction method comprising:

employing, as the pile press-in device, a pile press-in device in which the chuck device is tiltable about a chuck tilting axis that intersects with the mast and is in a direction in which the mast and the chuck device line up; and

pile supplying including causing the chuck device to be laid sideways and to project outward to a side of the pile

row as viewed from an axial direction of the existing pile by turning the mast and tilting the chuck device, laying the pile sideways, supplying the pile, inserting the pile into the chuck device, and causing the chuck device to grasp the pile.

[Claim 2]

The pile press-in construction method according to claim 1, wherein, in the pile supplying, the pile is inserted into the chuck device from behind in a direction in which the pile row extends.

[Claim 3]

The pile press-in construction method according to claim 1, wherein, in the pile supplying, the pile is inserted into the chuck device from in front in a direction in which the pile row extends.

[Claim 4]

The pile press-in construction method according to one of claims 1 to 3, wherein

the pile press-in device includes a slide base that is horizontally movable on the saddle,

the mast is erected on the slide base in a turnable manner, and

in the pile supplying, an insertion length of the pile into the chuck device is increased upon a stroke of the slide base.

[Claim 5]

The pile press-in construction method according to claim 4, wherein

the raising and lowering device of the pile press-in device is tiltable about the chuck tilting axis together with the chuck device, and

in the pile supplying, an insertion length of the pile into the chuck device is increased upon a stroke of the raising and lowering device.

[Claim 6] The pile press-in construction method according to claim 2 or 3, wherein

a pile press-in device in which the mast is tiltable such that the chuck device moves up and down is employed as the pile press-in device, and

in a part or all of the inserting of the pile into the chuck device in the pile supplying, the mast is caused to tilt such that a height of a grasping central axis of the chuck device in a laid-sideways state is adjusted.

[Claim 7]

The pile press-in construction method according to claim 1, in which a pile formed by a plurality of divided piles being connected in a longitudinal direction is pressed into the ground, the pile press-in construction method comprising:

pile connecting of a next divided pile including holding, with a holding chuck attachment that clamps an upper end of an existing pile and is secured to the existing pile, an upper end of one of the divided piles that is a leading pile at a time of pressing in.

[Claim 8]

The pile press-in construction method according to claim 1, wherein

the chuck device has a plurality of grasping members that perform a gathering/dispersing operation with respect to the pile, and

a pile having a grasped dimension smaller than a grasped dimension that the chuck device can grasp is grasped and pressed in with a grasping attachment unit, the grasping attachment unit having a plurality of grasping attachments and a bracket, the plurality of grasping attachments being mounted to grasping surfaces of the grasping members and

performing a gathering/dispersing operation together with the grasping members, the bracket restricting movement of at least one of the grasping attachments that is on one side around a grasping central axis into a dispersion direction in the gathering/dispersing operation upon the grasping central axis being laid horizontally, the bracket releasing restriction of movement in the dispersion direction upon the grasping central axis being erected.

[Claim 9]

A pile supplying device that supplies a pile to a chuck device of a pile press-in device, the pile press-in device generating a reaction force by gripping an upper end of an existing pile, grasping the pile by the chuck device, and pressing the pile into the ground, the chuck device being movable up and down, the pile supplying device comprising:

a pickup arm that picks up and moves the pile in a laid-sideways state,

wherein a fork capable of picking up, raising, and lowering the pile is provided at a tip of the pickup arm.

[Claim 10]

The pile supplying device according to claim 9, wherein the fork is configured of at least two prongs and has a shape

that is insertable into a gap between a plurality of steel sheet piles that are stacked vertically and loaded.

[Claim 11]

The pile supplying device according to claim 9, wherein the pickup arm has a hinged connector that enables the fork to swing within a horizontal plane.

[Claim 12]

The pile supplying device according to claim 11, wherein the pickup arm has a swing arm that supports the hinged connector at a tip and swings within a horizontal plane.

[Claim 13]

A pile press-in device comprising:

the pile supplying device according to claim 12;

a saddle; a clamp device that is provided at a bottom of the saddle and grasps an upper end of an existing pile that has been pressed into the ground; a mast erected in a turnable manner on the saddle; a raising and lowering device; and a chuck device that is supported by the mast via the raising and lowering device and holds a pile,

wherein a base end of the pickup arm is secured to the saddle, and

the chuck device is tiltable about a chuck tilting axis that intersects with the mast and is in a direction in which the mast and the chuck device line up.

[Claim 14]

The pile press-in device according to claim 13, comprising a slide base that is horizontally movable on the saddle, wherein the mast is erected on the slide base in a turnable manner.

[Claim 15]

The pile press-in device according to claim 14, wherein the raising and lowering device is tiltable about the chuck tilting axis together with the chuck device.

[Claim 16]

The pile press-in device according to claim 15, comprising:

a control device that controls rotation and tilting of the chuck device, the chuck device being rotatable around a grasping central axis; and

a sensor that detects whether or not a hydraulic oil tank incorporated in the chuck device is at a portion of the chuck device that drops upon the tilting of the chuck device, wherein

the control device performs a limitation control function in which the rotation of the chuck device around the grasping central axis is controlled such that the chuck device tilts in a state where the sensor detects that the hydraulic oil tank of the chuck device is at the portion of the chuck device that drops.

[Claim 17]

The pile press-in device according to any one of claims 13 to 16, wherein the mast is tiltable, and the chuck device moves up and down in response to tilting of the mast.