

[Document Type] Specification

[Title of the Invention] CONTINUOUS WALL INSTALLATION METHOD AND CONTINUOUS WALL INSTALLING ATTACHMENT

[Technical Field of the Invention]

[0001]

The present invention relates to a continuous wall installation method and a continuous wall installing attachment.

Priority is claimed on Japanese Patent Application No. 2013-209552, filed on October 4, 2013, the content of which is incorporated herein by reference.

[Related Art]

[0002]

In the related art, when construction work for retaining walls, quay walls, a foundation, or cut-off walls is carried out in the civil engineering and construction field, U-shaped steel sheet piles, Z-shaped steel sheet piles, hat-shaped steel sheet piles or straight steel sheet piles have been widely used (for example, refer to Patent Documents 1 to 5). In addition, in some cases, these steel sheet piles are used as combined steel sheet piles (wall body structure members) in combination with H-shaped steel members (H-section steel) or T-shaped steel members (T-section steel).

[0003]

For example, the combined steel sheet pile is used in constructing a pier. FIGS. 16A and 16B are schematic views showing a pier 2 which is built in a quay 1 using multiple combined steel sheet piles 4. FIG. 16A is a schematic side view, and FIG. 16B is a schematic front view. As shown in FIGS. 16A and 16B, a column 6 is arranged immediately below the pier 2 (landing place), and has a function to support the pier 2 on a ground 3 which is uneven. In addition, a steel sheet pile 5 has a function to prevent the outflow of soil or rock from the ground 3 located below the pier 2. As shown in FIG. 16B, multiple adjacent steel sheet piles 5 are connected to each other so as to form a continuous wall 9 along a wall body direction X (width direction of the steel sheet pile 5, refer to FIG. 16B).

[0004]

When the pier 2 is constructed, installation work is carried out while a joint of the steel sheet pile 5 to be installed subsequently is connected to a joint of the previously installed steel sheet pile 5. While this procedure is repeated, the multiple combined steel sheet piles 4 are sequentially installed on the ground 3. In this case, in order to reliably connect (interlock) the joints of the adjacent steel sheet piles 5 to each other, it is necessary to visibly check the connecting when the connecting starts.

Accordingly, an upper end portion of the steel sheet pile 5 needs to appear above the water after the installation work.

[Citation List]

[Patent Document]

[0005]

[Patent Document 1] Japanese Unexamined Patent Application, First Publication No. 2002-004241

[Patent Document 2] Japanese Unexamined Patent Application, First Publication No. 2002-081038

[Patent Document 3] Japanese Unexamined Patent Application, First Publication No. 2003-253644

[Patent Document 4] Japanese Unexamined Patent Application, First Publication No. 2003-306920

[Patent Document 5] Japanese Unexamined Patent Application, First Publication No. 2005-139680

[Disclosure of the Invention]

[Problems to be Solved by the Invention]

[0006]

However, when the upper end portion of the installed steel sheet pile 5 appears above the water, some problems arise.

The first problem is an increase in cost caused by an increase in steel weight. The function of the steel sheet pile 5 is to prevent the outflow of soil or rock from the ground 3. Accordingly, a portion above the ground 3 is in an unnecessary range as a structure. For this reason, when the upper end portion of the installed steel sheet pile 5 appears above the water, the steel sheet pile 5 is extended up to the unnecessary range as the structure, thereby increasing the steel weight and the cost. In addition, in this case, water pressure generated by waves (water flow) is received by a wide wall surface of a continuous wall, thereby applying a strong external force to the pier 2. Therefore, in order to ensure rigidity of the continuous wall which can withstand the water pressure, in some cases, it becomes necessary to use the steel sheet pile 5 which is sufficiently thick. As a result, the steel weight increases, and thus the cost increases.

The second problem is discontinuity of a water area. When the upper end portion of the installed steel sheet pile 5 appears above the water, the continuous wall completely blocks the water flow. Thus, water stays in a lower side region of the pier 2. As a result, in some cases, the water becomes murkier, or sludge is deposited.

[0007]

As one solution to avoid these problems, it is conceivable that the steel sheet pile 5 be caused to sink into the water by shortening the length (height) of the steel sheet pile 5. In this case, in order to install the steel sheet pile 5 in the water while the joints of the adjacent steel sheet piles 5 are connected to each other, a diver needs to dive into the water so as to carry out connecting work for the joints. However, underwater work is more laborious than work on the water. Moreover, when visibility is poor due to the murky water, there is a possibility that the connecting work itself may not be carried out.

[0008]

The present invention is made in consideration of the above circumstances, and an object thereof is to provide a continuous wall installation method by which a continuous wall including multiple steel sheet piles is inexpensively and easily installed in the water, and a continuous wall installing attachment which is suitably used for the continuous wall installation method.

[Means for Solving the Problem]

[0009]

In order to solve the above problems, the present invention adopts the following.

(1) According to an aspect of the present invention, a continuous wall installation method is provided by which a continuous wall is constructed by installing multiple steel sheet piles having connecting sections in water while the connecting sections are connected to each other. The continuous wall installation method includes: a first attachment connection process of connecting a continuous wall installing attachment having a guide section which has the same shape as the connecting section to the steel sheet pile so that the guide section is joined to the connecting section; a first installation process of installing the steel sheet pile after the first attachment connection process in the water so that a portion of the guide section of the continuous wall installing attachment appears above the water surface; a second installation process of installing the other steel sheet pile in the water while the connecting section of the other steel sheet pile is connected to the guide section of the continuous wall installing attachment and subsequently to the connecting section of the steel sheet pile after the first installation process; and an attachment detaching process of detaching the continuous wall installing attachment from the steel sheet pile after the second installing.

(2) In the aspect according to (1), the continuous wall installation method may further include a second attachment connection process of connecting the other continuous wall installing attachment having a guide section which has the same shape as the connecting section of the other steel sheet pile to the other steel sheet pile so that the guide section of the other continuous wall installing attachment is joined to the connecting section of the other steel sheet pile, before the second installation process.

(3) In the aspect according to (1) or (2), a column may be fixed to the steel sheet pile in advance, and the other column may be fixed to the other steel sheet pile in advance. The steel sheet pile may be installed by transmitting an installing drive force to the column during the first installation process, and the other steel sheet pile may be installed by transmitting an installing drive force to the other column during the second installation process.

(4) According to another aspect of the present invention, a continuous wall installing attachment is provided which is used when a continuous wall is constructed by installing multiple steel sheet piles having connecting sections in the water while the connecting sections are connected to each other. The continuous wall installing attachment includes an attachment main body that has a width which is smaller than a distance between the connecting sections respectively disposed in one side edge and the other side edge of the steel sheet pile, a guide section that is disposed in the attachment main body, and that has the same shape as the connecting section, and a positioning member that is disposed in the attachment main body, and that positions the attachment main body for the steel sheet pile so that the guide section is joined to the connecting section, when being connected to the steel sheet pile. The continuous wall installing attachment is attachable to and detachable from the steel sheet pile.

(5) In the aspect according to (4), the continuous wall installing attachment may further include a fixing section that is detachably fixed to a column which is fixed to the steel sheet pile.

(6) In the aspect according to (4) or (5), a through-hole for passing from one surface through the other surface of the attachment main body may be disposed in the attachment main body.

[Effects of the Invention]

[0010]

According to the continuous wall installation method of the above (1), the continuous wall installing attachment having the guide section which has the same shape as the connecting section of the steel sheet pile is connected to the steel sheet pile so that the guide section is joined to the connecting section of the steel sheet pile. Accordingly, even when a steel sheet pile which is short enough to sink into the water is used, the length of the guide section can compensate for a shortage of the length of the connecting section. That is, the length of the connecting section of the steel sheet pile can be extended so as to rise above the water. Therefore, the continuous wall can be inexpensively and easily installed in the water.

[0011]

In the above (2), the connecting section of the other steel sheet pile after being installed in the water can be extended so as to rise above the water by the guide section of the other continuous wall installing attachment. Therefore, installation work can be carried out while connecting work on the water starts for another steel sheet pile.

[0012]

In the above (3), even when the length of the steel sheet pile and the other steel sheet pile is short, the installing drive force can be reliably applied to the steel sheet pile and the other steel sheet pile via the column and the other column.

[0013]

According to the continuous wall installing attachment of the above (4), the continuous wall installing attachment has the guide section which has the same shape as the connecting section of the steel sheet pile. Accordingly, when the continuous wall installing attachment is combined with the steel sheet pile, the length of the connecting section can be extended. In addition, the continuous wall installing attachment has the positioning member which positions the attachment main body for the steel sheet pile. Accordingly, the attachment main body can be accurately connected to the steel sheet pile so that the guide section and the connecting section coincide with each other. In addition, the continuous wall installing attachment is attachable to and detachable from the steel sheet pile. Accordingly, after the steel sheet pile is installed, the continuous wall installing attachment can be detached from the steel sheet pile so as to be reused for the subsequent process. Therefore, even when the short steel sheet pile is used, the continuous wall can be inexpensively and easily installed in the water.

The attachment main body has a smaller width than the steel sheet pile to be installed. Accordingly, it is possible to decrease water pressure which the attachment main body receives due to water flow during the installation work by decreasing a surface area of the attachment main body. In addition, the weight of the continuous

wall installing attachment becomes lighter. Therefore, it is possible to reduce the manufacturing costs and to improve safety in the installation work.

[0014]

In the above (5), the continuous wall installing attachment has the fixing tool that is detachably fixed to the column which is fixed to the steel sheet pile. Therefore, it is possible to further prevent the attachment main body from being misaligned with the steel sheet pile.

[0015]

In the above (6), the water pressure received by the attachment main body when the steel sheet pile is installed can be released through the through-hole. Accordingly, it is possible to further improve safety in the installation work. In addition, the weight of the continuous wall installing attachment becomes lighter. Therefore, the manufacturing costs can be reduced. Since the continuous wall installing attachment is easily handled, it is possible to improve safety in the installation work.

[Brief Description of the Drawings]

[0016]

FIG. 1A is a perspective view showing a continuous wall installing attachment according to a first embodiment of the present invention.

FIG. 1B is a plan view showing the continuous wall installing attachment according to the first embodiment of the present invention.

FIG. 2A is a perspective view showing a state where the continuous wall installing attachment according to the first embodiment of the present invention is assembled to a combined steel sheet pile.

FIG. 2B is a plan view showing a state where the continuous wall installing attachment according to the first embodiment of the present invention is fixed to the combined steel sheet pile.

FIG. 3A is a view describing a method of installing a continuous wall in water by using the continuous wall installing attachment according to the first embodiment of the present invention.

FIG. 3B is a view describing a method of installing the continuous wall in the water by using the continuous wall installing attachment according to the first embodiment of the present invention.

FIG. 3C is a view describing a method of installing the continuous wall in the water by using the continuous wall installing attachment according to the first embodiment of the present invention.

FIG. 3D is a view describing a method of installing the continuous wall in the water by using the continuous wall installing attachment according to the first embodiment of the present invention.

FIG. 4 is a perspective view showing a modification example of the continuous wall installing attachment according to the first embodiment of the present invention.

FIG. 5 is a perspective view showing a modification example of the continuous wall installing attachment according to the first embodiment of the present invention.

FIG. 6 is a perspective view showing a modification example of the continuous wall installing attachment according to the first embodiment of the present invention, and is a view showing a state where the continuous wall installing attachment is assembled and fixed to the combined steel sheet pile.

FIG. 7A is a perspective view showing a modification example of the continuous wall installing attachment according to the first embodiment of the present invention.

FIG. 7B is a plan view showing a modification example of the continuous wall installing attachment according to the first embodiment of the present invention.

FIG. 8 is a perspective view showing a modification example of the continuous wall installing attachment according to the first embodiment of the present invention, and is a view showing a state where the continuous wall installing attachment is assembled and fixed to the combined steel sheet pile.

FIG. 9 is an enlarged view of a portion indicated by a two-dot chain line A shown in FIG. 2A, and is a view showing a modification example of the continuous wall installing attachment according to the first embodiment of the present invention.

FIG. 10 is a sectional view taken along line A-A shown in FIG. 9, and is a view showing a modification example of the continuous wall installing attachment according to the first embodiment of the present invention.

FIG. 11A is a perspective view showing a modification example of the continuous wall installing attachment according to the first embodiment of the present invention, and is a view showing a state where the continuous wall installing attachment is assembled and fixed to the combined steel sheet pile.

FIG. 11B is a plan view showing a state where the continuous wall installing attachment shown in FIG. 11A is assembled to the combined steel sheet pile.

FIG. 12 is a perspective view showing a continuous wall installing attachment according to a second embodiment of the present invention.

FIG. 13 is a perspective view showing a state where the continuous wall installing attachment according to the second embodiment of the present invention is

assembled to the combined steel sheet pile.

FIG. 14 is a perspective view showing a modification example of the continuous wall installing attachment according to the second embodiment of the present invention.

FIG. 15 is a perspective view showing a state where the continuous wall installing attachment shown in FIG. 14 is assembled and fixed to the combined steel sheet pile.

FIG. 16A is a schematic side view showing a pier structure built in a quay.

FIG. 16B is a schematic front view of the pier structure shown in FIG. 16A, and is a view when the pier structure is viewed in a direction B shown in FIG. 16A.

FIG. 17A is a perspective view showing a combined steel sheet pile configured to include a hat-shaped steel sheet pile and H-section steel.

FIG. 17B is a plan view showing the combined steel sheet pile configured to include the hat-shaped steel sheet pile and the H-section steel.

[Embodiments of the Invention]

[0017]

(First Embodiment)

Hereinafter, each embodiment of the present invention will be described in detail with reference to the drawings. In the description herein and the drawings, the same reference numerals will be given to configuration elements which have substantially the same function and configuration, and repeated description will be omitted.

[0018]

First, a continuous wall installing attachment 100 according to a first embodiment of the present invention will be described. FIGS. 1A and 1B are views showing the continuous wall installing attachment 100 according to the present embodiment. FIG. 1A is a perspective view, and FIG. 1B is a plan view. As shown in FIGS. 1A and 1B, the continuous wall installing attachment 100 includes an attachment main body 110 and a positioning member 120 provided in a lower end portion of the attachment main body 110. Although it will be described later, the continuous wall installing attachment 100 is detachably attached to a combined steel sheet pile 4 (refer to FIGS. 17A and 17B) configured to include a hat-shaped steel sheet pile 5 (steel sheet pile) and an H-section steel 6 (column).

[0019]

The attachment main body 110 of the continuous wall installing attachment 100 has a guide section 110a, an arm section 110b, a web section 110c having a lifting hole

112 disposed therein, and a flange section 110d having multiple bolt holes 111 disposed therein. As shown in FIG. 1B, a planar shape of the attachment main body 110 is the same as a half divided shape of the steel sheet pile 5 (not shown in FIGS. 1A and 1B, refer to FIGS. 17A and 17B). Therefore, a width W of the attachment main body 110 (length of the attachment main body 110 in a width direction X (wall body direction X): refer to FIG. 1B) is smaller than a width d of the steel sheet pile 5 (distance between joints (connecting sections) respectively disposed in both side edges of the steel sheet pile: refer to FIG. 17B).

[0020]

Here, the “half divided shape of the steel sheet pile 5” means a shape of one side obtained when the steel sheet pile 5 is cut into two pieces by a plane which passes through a flange section 5d of the steel sheet pile 5 in a plan view and which is parallel to a material axis direction Z of the steel sheet pile 5 (height direction of the steel sheet pile 5, direction in which the steel sheet pile 5 is installed, or vertical direction: refer to FIG. 17A). In addition, the “same shape” means that a horizontal section of the attachment main body 110 (cross section parallel to the direction X in FIG. 1A) is the same as a horizontal section of the half divided shape of the steel sheet pile 5.

[0021]

That is, in the attachment main body 110, the guide section 110a, the arm section 110b, and the web section 110c respectively have the same shape as a joint 5a (connecting section), an arm section 5b, and a web section 5c of the steel sheet pile 5. In addition, the flange section 110d of the attachment main body 110 has the same shape as a portion of the flange section 5d of the steel sheet pile 5.

[0022]

Although dimensions vary depending on installation conditions of the steel sheet pile 5, a height H of the attachment main body 110 (length of the attachment main body 110 in the direction Z in FIG. 1A) is 5 m to 10 m, for example. The width W of the attachment main body 110 is 0.5 m, for example.

[0023]

When the continuous wall installing attachment 100 is manufactured, a steel sheet pile having the same shape as the steel sheet pile 5 to be installed is cut in the material axis direction Z. In this manner, the cut steel sheet pile can be used as the attachment main body 110.

[0024]

The positioning members 120 of the continuous wall installing attachment 100 are formed of a pair of plates 120a and 120b, and are respectively disposed in the web

section 110c and the arm section 110b of the attachment main body 110. The positioning members 120 are fixed to the attachment main body 110 by means of welding or by using bolts. Although it will be described later, when the continuous wall installing attachment 100 is assembled to the steel sheet pile 5, the positioning members 120 position the attachment main body 110 for the steel sheet pile 5 in the direction X and in a direction Y (direction orthogonal to the width direction X: refer to FIGS. 1A and 1B) by holding upper end portions of the web section 5c and the arm section 5b of the steel sheet pile 5. Therefore, there is a gap corresponding to at least the thickness of the steel sheet pile 5 between the pair of plates 120a and 120b forming the positioning member 120.

[0025]

In FIGS. 1A and 1B, the positioning members 120 are respectively disposed in both the web section 110c and the arm section 110b of the continuous wall installing attachment 100. Then, the positioning member 120 (120a and 120b) on the left side of the paper surface in FIG. 1B takes charge of positioning in the direction Y, and the positioning member 120 (120a and 120b) on the right side of the paper surface in FIG. 1B takes charge of positioning in both the direction X and the direction Y. That is, as shown in FIGS. 2A and 2B, the pair of positioning members 120 are respectively attached to the web section 5c and the arm section 5b of the steel sheet pile 5. In this manner, a groove of the guide section 110a of the continuous wall installing attachment 100 can be aligned with a groove of the joint 5a of the steel sheet pile 5.

The number of the positioning members 120 is not limited to a pair (two locations). The positioning member 120 may be disposed at one location, or may be disposed at three or more locations.

[0026]

For example, three bolt holes 111 used for fixing the continuous wall installing attachment 100 to the combined steel sheet pile 4 are disposed in the upper end portion of the flange section 110d of the attachment main body 110. On the other hand, three bolt holes 131 are similarly disposed in the H-section steel 6 (column) of the combined steel sheet pile 4. Respective positions of the bolt hole 111 and the bolt hole 131 coincide with each other when the continuous wall installing attachment 100 is assembled to the combined steel sheet pile 4. Then, as shown in FIG. 2B, in a state where the bolt hole 111 coincides with the bolt hole 131, the continuous wall installing attachment 100 can be fixed to the combined steel sheet pile 4 by a bolt 130a being fastened to a nut 130b after passing through the nut 130b. Instead of the nut 130b, a female screw may be formed in either the bolt hole 131 or the bolt hole 111.

[0027]

In addition, for example, one lifting hole 112 used for lifting the continuous wall installing attachment 100 is disposed in the upper end portion of the web section 110c of the attachment main body 110. When the continuous wall installing attachment 100 is lifted, a wire or a hook is inserted into the lifting hole 112, thereby enabling a machine such as a winch to lift the continuous wall installing attachment 100. The lifting hole 112 may be disposed in the arm section 110b. However, it is preferable to dispose the lifting hole 112 immediately above the center of gravity of the continuous wall installing attachment 100 so as not to be obliquely lifted.

[0028]

Instead of the lifting hole 112, the continuous wall installing attachment 100 may be lifted by disposing a projection portion (not shown) and hooking a wire or a hook to the projection portion.

[0029]

FIG. 2A is a perspective view showing a state where the continuous wall installing attachment 100 is assembled (connected) to the combined steel sheet pile 4 configured to include the hat-shaped steel sheet pile 5 and the H-section steel 6 (column). The forward side on the paper surface in the direction Y in FIG. 2A is referred to as a back surface side, and the rearward side on the paper surface is referred to as a front surface side. Hereinafter, this is similarly applied to all of the drawings in the description herein.

[0030]

As shown in FIG. 2A, the continuous wall installing attachment 100 is assembled immediately above the steel sheet pile 5. When the continuous wall installing attachment 100 is assembled to the steel sheet pile 5, the continuous wall installing attachment 100 is assembled (connected) to the combined steel sheet pile 4 while being moved from the upper side to the lower side in the direction Z so that the positioning members 120 hold the upper end portions of the web section 5c and the arm section 5b of the steel sheet pile 5.

[0031]

In a state where the continuous wall installing attachment 100 is assembled to the combined steel sheet pile 4, the positioning members 120 hold the steel sheet pile 5, thereby positioning the continuous wall installing attachment 100 for the combined steel sheet pile 4 in the directions X and Y. In addition, the lower end surface of the attachment main body 110 of the continuous wall installing attachment 100 and the upper end surface of the steel sheet pile 5 come into contact with each other, thereby

positioning the continuous wall installing attachment 100 for the combined steel sheet pile 4 in the direction Z. Therefore, the continuous wall installing attachment 100 can be accurately assembled to the combined steel sheet pile 4.

[0032]

In addition, in the combined steel sheet pile 4, an upper end of the H-section steel 6 is located above an upper end of the hat-shaped steel sheet pile 5 in the direction Z. The height (length) from the upper end of the H-section steel 6 to the upper end of the hat-shaped steel sheet pile 5 is represented by the reference numeral h (refer to FIG. 17A). In the attachment main body 110 of the continuous wall installing attachment 100, the height H (refer to FIG. 1A) is higher than the height from the upper end of the steel sheet pile 5 to the water surface when the steel sheet pile 5 is installed in the water, and is lower than the height h (refer to FIG. 17A) in the combined steel sheet pile 4. The reason for this is to avoid the interference between installing equipment and the continuous wall installing attachment 100 when the upper end of the H-section steel 6 is chucked by the installing equipment. Therefore, in a state where the continuous wall installing attachment 100 is assembled to the combined steel sheet pile 4, the upper end of the continuous wall installing attachment 100 is located below the upper end of the H-section steel 6 in the direction Z. However, if the installing equipment and the continuous wall installing attachment 100 do not interfere with each other when the upper end of the H-section steel 6 is chucked by the installing equipment, the height H of the attachment main body 110 of the continuous wall installing attachment 100 may be set to be higher than the height h in the combined steel sheet pile 4.

[0033]

FIG. 2B is a plan view showing a state where the continuous wall installing attachment 100 is fixed to the combined steel sheet pile 4 by using a fixing tool 130 configured to include the bolt 130a and the nut 130b. As described above, in a state where the continuous wall installing attachment 100 is assembled to the combined steel sheet pile 4, mutual positions of the bolt hole 111 of the continuous wall installing attachment 100 and the bolt hole 131 of the combined steel sheet pile 4 coincide with each other. Therefore, as shown in FIG. 2B, the bolt 130a is fastened to the nut 130b after passing through the bolt hole 111 and the bolt hole 131. In this manner, the continuous wall installing attachment 100 can be fixed to the combined steel sheet pile 4. In this way, the continuous wall installing attachment 100 is fixed to the combined steel sheet pile 4 by using the fixing tool 130. Accordingly, it is possible to prevent the continuous wall installing attachment 100 from being misaligned with the combined steel sheet pile 4.

[0034]

As described above, the continuous wall installing attachment 100 is assembled to the combined steel sheet pile 4 by using the positioning members 120, and the bolt 130a and the nut 130b of the fixing tool 130 are fastened to each other, thereby fixing the continuous wall installing attachment 100 to the combined steel sheet pile 4. Therefore, after the continuous wall installing attachment 100 is fixed to the combined steel sheet pile 4, the continuous wall installing attachment 100 can be detached from the combined steel sheet pile 4 by unfastening the fixing tool 130. That is, the continuous wall installing attachment 100 is attachable to and detachable from the combined steel sheet pile 4.

[0035]

As described above, the shape of the attachment main body 110 of the continuous wall installing attachment 100 is the same as the half divided shape of the steel sheet pile 5. As a result, in a state where the continuous wall installing attachment 100 is assembled to the combined steel sheet pile 4, the respective positions of the guide section 110a, the arm section 110b, the web section 110c, and the flange section 110d of the continuous wall installing attachment 100 coincide with the respective positions of the joint 5a, the arm section 5b, the web section 5c, and the flange section 5d of the steel sheet pile 5. Therefore, the length (height) of the joint 5a of the steel sheet pile 5 can be extended to the amount of the height H by assembling the continuous wall installing attachment 100 to the combined steel sheet pile 4.

[0036]

In this way, the continuous wall installing attachment 100 is assembled and fixed (attached) to the steel sheet pile 5. Accordingly, the continuous wall can be constructed by sequentially installing the multiple combined steel sheet piles 4 in the water while the joints 5a of the mutually adjacent steel sheet piles 5 are connected to each other. A method of installing the continuous wall in the water will be described later.

[0037]

[Installation Method of Continuous Wall]

Next, a method of installing a continuous wall 9 (multiple steel sheet piles in which adjacent steel sheet piles are connected to each other) in the water by using the continuous wall installing attachment 100 according to the present embodiment will be described. In the following description, the multiple combined steel sheet piles 4 and the multiple continuous wall installing attachments 100 are respectively employed. However, in order to describe each member so as to be distinguishable, another part

number may be used in some cases. In the drawings, the reference numeral WL represents a water level, and the reference numeral GL represents a ground level in the water.

[0038]

FIGS. 3A to 3D are views describing the method of installing the continuous wall 9 in the water, and are perspective front views of the combined steel sheet pile 4 and the continuous wall installing attachment 100. First, as shown in FIG. 3A, a continuous wall installing attachment 100X having the same shape as the half divided shape of the steel sheet pile 5 of a combined steel sheet pile 4X is attached to a combined steel sheet pile 4X. Thereafter, the combined steel sheet pile 4X is installed on the ground level in the water. When the combined steel sheet pile 4X is installed, it is preferable to install the combined steel sheet pile 4X by causing a chuck of a vibratory hammer to grip the web section 6b of the H-section steel 6. In this case, an installing drive force can be reliably applied from the H-section steel 6 to the combined steel sheet pile 4X.

[0039]

The height H (refer to FIG. 1A) of the attachment main body 110 of the continuous wall installing attachment 100X is set so that the upper end portion of the attachment main body 110 rises above the water during the installation. Therefore, in a state where the combined steel sheet pile 4X is completely installed in the water, the upper end portion of the attachment main body 110 of the continuous wall installing attachment 100X appears above the water.

[0040]

In a state where the continuous wall installing attachment 100X is assembled in this way, the combined steel sheet pile 4X is installed. Accordingly, even when the steel sheet pile 5 sinks into the water during the installation, the height (length) of the guide section 110a of the continuous wall installing attachment 100 can compensate for the height (length) from the upper end of the steel sheet pile 5 to the water level. That is, the height (length) of the joint 5a of the steel sheet pile 5 can be extended so that the joint 5a of the steel sheet pile 5 rises above the water.

[0041]

Next, similarly to the case of the above-described combined steel sheet pile 4X, a continuous wall installing attachment 100Y having the same shape as the half divided shape of the steel sheet pile 5 of a combined steel sheet pile 4Y is attached to the combined steel sheet pile 4Y. Thereafter, as shown in FIG. 3A, the joint 5a of the steel sheet pile 5 of the combined steel sheet pile 4Y is slid while being connected to the

guide section 110a of the continuous wall installing attachment 100X and subsequently the joint 5a of the steel sheet pile 5 of the combined steel sheet pile 4X, thereby installing the combined steel sheet pile 4Y on the ground level in the water. In this case, the guide section 110a of the continuous wall installing attachment 100X appears above the water. Accordingly, the combined steel sheet pile 4Y can be installed while the joint 5a of the steel sheet pile 5 of the combined steel sheet pile 4Y starts to be connected above the water.

Therefore, even when the steel sheet pile 5 of the combined steel sheet pile 4X sinks into the water, the combined steel sheet pile 4Y can be easily connected to the combined steel sheet pile 4X. In addition, the upper end portion of the steel sheet pile 5 does not need to appear above the water during the installation. Accordingly, the weight of the combined steel sheet pile 4 can be reduced by shortening the total length.

[0042]

As described above, the installation work is carried out on the ground level in the water while the joint 5a of the combined steel sheet pile 4Y is connected to the joint 5a of the combined steel sheet pile 4X. In this manner, the combined steel sheet pile 4X and the combined steel sheet pile 4Y are brought into a mutually connected state (refer to FIG. 3B).

[0043]

Next, as shown in FIG. 3C, the continuous wall installing attachment 100X is detached from the combined steel sheet pile 4X. In this case, the fixing tool 130 (bolt 130a and nut 130b) which fixes the continuous wall installing attachment 100X to the combined steel sheet pile 4X is first unfastened. The fixing tool 130 is detached from the continuous wall installing attachment 100X and the combined steel sheet pile 4X. Then, a wire 30 is hooked to the lifting hole 112 so that a crane 20 lifts the continuous wall installing attachment 100X upward. In this way, the continuous wall installing attachment 100X can be detached from the combined steel sheet pile 4X.

[0044]

As described above, since the fixing tool 130 is detached after the installation, it is preferable to arrange the fixing tool 130 in the upper end portion of the continuous wall installing attachment 100. That is, it is preferable to dispose the bolt hole 111 of the continuous wall installing attachment 100 in the upper end portion of the flange section 110d of the attachment main body 110 so that the bolt hole 111 appears above the water. In this case, work for detaching the fixing tool 130 after the installation can be easily carried out above the water.

[0045]

When the other combined steel sheet pile 4 is installed after the work for detaching the continuous wall installing attachment 100 shown in FIG. 3C is completed, the continuous wall installing attachment 100 is attached to the combined steel sheet pile 4 as shown in FIG. 3D. Thereafter, the installation work is carried out on the ground level in the water while the joint 5a of the combined steel sheet pile 4 is connected to the guide section 110a of the continuous wall installing attachment 100Y and the joint 5a of the combined steel sheet pile 4Y. The continuous wall installing attachment 100 can be detached from (is attachable to and detachable from) the combined steel sheet pile 4. Therefore, the previously detached continuous wall installing attachment 100X can also be reused.

[0046]

At the time of the work shown in FIGS. 3A to 3D, the continuous wall 9 including three steel sheet piles 5 is installed in the water. When the work is further continuously carried out so as to install the continuous wall 9 including four or more steel sheet piles 5, similar work may be repeatedly carried out.

[0047]

According to the above-described installation method (construction method) of the continuous wall 9, the continuous wall 9 including multiple steel sheet piles 5 can be inexpensively and easily installed in the water. In the installation method of the above-described continuous wall 9, a case has been described in which the continuous wall installing attachment 100Y is attached to the combined steel sheet pile 4Y as shown in FIG. 3B. However, when the continuous wall 9 including two steel sheet piles 5 is installed, it is not necessary to attach the continuous wall installing attachment 100Y to the combined steel sheet pile 4Y in advance.

[0048]

[Modification Example of Continuous Wall Installing Attachment]

FIG. 4 is a perspective view showing a modification example of the continuous wall installing attachment 100 according to the present embodiment. As shown in FIG. 4, a through-hole 113 (drain hole) for passing from one surface through the other surface of the attachment main body 110 is disposed in the attachment main body 110 of the continuous wall installing attachment 100. According to this structure, water pressure received by the attachment main body 110 can be released from the through-hole 113 when the steel sheet pile 5 is installed. Accordingly, it is possible to improve safety in the installation work by minimizing vibrations of the continuous wall installing attachment 100 which are generated by the water pressure. In addition, the weight of the continuous wall installing attachment 100 becomes lighter. Therefore,

the manufacturing costs can be reduced. Since the continuous wall installing attachment 100 is easily handled, it is possible to improve safety in the installation work. In FIG. 4, the through-hole 113 is disposed in the web section 110c and the arm section 110b of the attachment main body 110. However, the through-hole 113 may be disposed in only any one of the web section 110c and the arm section 110b of the attachment main body 110.

[0049]

In addition, for example, as shown in FIG. 5, two L-shaped plates 140 (positioning members) may be disposed in the flange section 110d in the continuous wall installing attachment 100 so as to have a gap corresponding to at least the thickness of a flange 6a of the H-section steel 6 between the flange section 110d and the H-section steel 6. In this case, as shown in FIG. 6, when the continuous wall installing attachment 100 is assembled to the combined steel sheet pile 4, the L-shaped plates 140 can hold the flange 6a of the H-section steel 6 therebetween. As a result, it is possible to further prevent the continuous wall installing attachment 100 from being misaligned with the combined steel sheet pile 4 in the direction Y. The installation of the L-shaped plate 140 is not limited to two locations. The L-shaped plate 140 may be disposed at one location, or may be disposed at three or more locations. When the multiple L-shaped plates 140 are disposed, it is preferable to dispose at least one L-shaped plate 140 for each of the upper end portion and the lower end portion of the continuous wall installing attachment 100.

When the H-section steel 6 is attached to a front surface side (refer to FIG. 2A) of the steel sheet pile 5 so as to configure the combined steel sheet pile 4, the L-shaped plate 140 may be disposed on the front surface side of the flange section 110d of the attachment main body 110.

[0050]

In addition, as shown in FIGS. 7A and 7B, for example, four round steel bars 150 (positioning members) may be disposed in the attachment main body 110 in the continuous wall installing attachment 100. In this case, it is possible to further prevent the continuous wall installing attachment 100 from being misaligned in the direction X and the direction Y. In addition, in this case, in order to further improve positioning accuracy, it is preferable that the round steel bar 150 be also disposed in a bent corner portion of the attachment main body 110.

FIGS. 7A and 7B show a case where the positioning member 120 and the round steel bar 150 are disposed in the continuous wall installing attachment 100. However, without disposing the positioning member 120, only the round steel bar 150 may be

disposed therein.

[0051]

In addition, for example, as shown in FIG. 8, a wedge 180 instead of the positioning member 120 may be disposed in the web section 110c of the attachment main body 110, and a wedge receiver 182 may be disposed in the web section 5c of the steel sheet pile 5. In this case, when the continuous wall installing attachment 100 is assembled to the combined steel sheet pile 4, the wedge 180 is connected into the wedge receiver 182. Accordingly, even when the positioning member 120 is not disposed, the continuous wall installing attachment 100 can be positioned for the combined steel sheet pile 4. The wedge 180 may be disposed in the arm section 110b of the attachment main body 110, and the wedge receiver 182 may be disposed in the arm section 5b of the steel sheet pile 5.

[0052]

In addition, for example, as shown in FIG. 9, the wedge 180 may be disposed in the guide section 110a of the attachment main body 110, and the wedge receiver 182 may be disposed in the joint 5a of the steel sheet pile 5. In this case, the continuous wall installing attachment 100 is positioned for the steel sheet pile 5 by the positioning member 120, the wedge 180, and the wedge receiver 182. Therefore, it is possible to further prevent the continuous wall installing attachment 100 from being misaligned.

[0053]

In addition, for example, as shown in FIG. 10, in the continuous wall installing attachment 100, an inverted V-shaped plate 190 instead of the positioning member 120 may be disposed in the lower end portion of the continuous wall installing attachment 100. The inverted V-shaped plate 190 is configured to include a pair of plates 190a and 190b, and the pair of plates 190a and 190b are respectively and obliquely attached to the lower end portion of the continuous wall installing attachment 100 by using a weld 10. In the inverted V-shaped plate 190, a gap between the pair of plates 190a and 190b is larger than the thickness of the steel sheet pile 5 in the lower portion of the plates 190a and 190b. Accordingly, when the continuous wall installing attachment 100 is assembled to the steel sheet pile 5, the inverted V-shaped plates 190 can easily hold the upper portion of the steel sheet pile 5 therebetween. In addition, the gap between the pair of plates 190a and 190b decreases upward in the direction Z. Accordingly, when the continuous wall installing attachment 100 is assembled to the steel sheet pile 5, the continuous wall installing attachment 100 is guided to a predetermined assembly position. Therefore, since the inverted V-shaped plate 190 is disposed, the continuous wall installing attachment 100 can be smoothly assembled to

the combined steel sheet pile 4.

[0054]

In addition, in the present embodiment, a case has been described where the shape of the continuous wall installing attachment 100 is the same as the half divided shape of the steel sheet pile 5. However, as shown in FIGS. 11A and 11B, the attachment main body 110 may have the same shape as the steel sheet pile 5. In this case, a width W' of the attachment main body 110 shown in FIG. 11B is the same as a distance d of the steel sheet pile 5 (width of the steel sheet pile 5: refer to FIG. 17B).

However, when the width of the attachment main body 110 is smaller than the distance of the steel sheet pile 5 to be installed (that is, in a case of the continuous wall installing attachment 100 shown in FIG. 1A), compared to when the width of the attachment main body 110 is the same as the distance of the steel sheet pile 5 to be installed (that is, in a case of the continuous wall installing attachment 100 shown in FIGS. 11A and 11B), a surface area of the attachment main body 110 can be minimized. As a result, it is possible to reduce water pressure which the continuous wall installing attachment 100 receives due to water flow during the installation. In addition, it is possible to reduce the weight of the continuous wall installing attachment 100. Therefore, compared to the continuous wall installing attachment 100 shown in FIGS. 11A and 11B, according to the continuous wall installing attachment 100 shown in FIG. 1A, it is possible to reduce the manufacturing costs and to improve safety in the installation work.

[0055]

(Second Embodiment)

Next, a continuous wall installing attachment 200 according to a second embodiment of the present invention will be described. The same reference numerals will be given to configuration elements which are the same as the above-described configuration elements, and repeated description will be omitted herein.

[0056]

FIG. 12 is a perspective view showing the continuous wall installing attachment 200 according to the present embodiment. In the first embodiment, a case has been described where the continuous wall installing attachment 100 is used in installing the combined steel sheet pile 4 configured to include the steel sheet pile 5 and the H-section steel 6. However, the continuous wall installing attachment 200 according to the present embodiment is used in installing a combined steel sheet pile 8 (refer to FIG. 13) configured to include the steel sheet pile 5 and a T-section steel 7.

[0057]

As shown in FIG. 12, in the continuous wall installing attachment 200, a bolt hole plate 210 used for fixing the continuous wall installing attachment 200 to the combined steel sheet pile 8 is disposed in the upper end portion of the flange section 110d of the continuous wall installing attachment 200. For example, three bolt holes 111 are disposed in the bolt hole plate 210.

[0058]

FIG. 13 is a perspective view showing a state where the continuous wall installing attachment 200 is assembled to the combined steel sheet pile 8. Similarly to the first embodiment, three bolt holes 131 are disposed in a web section 7b of the T-section steel 7 (column) of the combined steel sheet pile 8. Mutual positions of the bolt hole 111 and the bolt hole 131 coincide with each other in a state where the continuous wall installing attachment 200 is assembled to the combined steel sheet pile 8. In a state where the continuous wall installing attachment 200 is assembled to the combined steel sheet pile 8, the bolt 130a is fastened to the nut 130b after passing through the bolt hole 111 and the bolt hole 131. In this manner, the continuous wall installing attachment 200 can be fixed to the combined steel sheet pile 8.

[0059]

As a modification example of the continuous wall installing attachment 200 according to the present embodiment, for example, as shown in FIG. 14, two holding sections 220 (positioning members) for holding the web section 7b of the T-section steel 7 therebetween may be disposed in the flange section 110d of the attachment main body 110. The holding section 220 is configured to include a pair of plates 220a and 220b. A gap corresponding to at least the thickness of the web section 7b of the T-section steel 7 is disposed between the pair of plates 220a and 220b. As shown in FIG. 14, when the two holding sections 220 are disposed, it is preferable to dispose one holding section 220 in the lower end portion of the attachment main body 110, and to dispose the other holding section 220 in the upper end portion of the attachment main body 110.

[0060]

FIG. 15 is a perspective view showing a state where the continuous wall installing attachment 200 shown in FIG. 14 is assembled and fixed to the combined steel sheet pile 8. As shown in FIG. 15, the continuous wall installing attachment 200 is assembled to the combined steel sheet pile 8 so that the holding sections 220 hold the web section 7b of the T-section steel 7 therebetween. Similarly to the positioning member 120, the holding sections 220 take charge of positioning in the direction X. Therefore, the holding sections 220 are disposed so as to hold the web section 7b of the T-section steel 7 therebetween. In this manner, it is possible to further prevent the

continuous wall installing attachment 200 from being misaligned with the combined steel sheet pile 8.

[0061]

According to the present embodiment, when the T-section steel 7 is arranged on the front surface side of the steel sheet pile 5 so as to configure the combined steel sheet pile 8, the bolt hole plate 210 and the holding section 220 may be disposed on the front surface side of the flange section 110d of the continuous wall installing attachment 200.

[0062]

As the above, the respective embodiments of the present invention have been described. However, the embodiments are proposed as an example, and the scope of the present invention is not limited only to the embodiments. The embodiments can be implemented in other various forms, and can be omitted, replaced, or modified in various ways within the scope not departing from the gist of the invention. The embodiments or the modifications are included in the scope or the gist of the invention, and are similarly included in the scope of the invention described in claims and their equivalents.

[0063]

For example, in the first embodiment, as shown in FIG. 3A, a case has been described where the multiple combined steel sheet piles 4 are sequentially installed in the direction X from the left side on the paper surface toward the right side on the paper surface. However, the multiple combined steel sheet piles 4 may be sequentially installed in the direction X from the right side on the paper surface toward the left side on the paper surface. In this case, it is conceivable that the positioning member 120 be disposed in advance in the upper end portion of the attachment main body 110 in addition to the lower end portion of the attachment main body 110, and further that the bolt hole 111 and the lifting hole 112 also be disposed in advance in the lower end portion of the attachment main body 110 in addition to the lower end portion of the attachment main body 110. When a vertically symmetrical structure is employed in this way, the continuous wall installing attachment 100 may be used upside down depending on a construction direction of the continuous wall.

[0064]

In addition, for example, in the first embodiment, a case has been described where the attachment main body 110 of the continuous wall installing attachment 100 has the same shape as the half divided shape of the steel sheet pile 5 or has the same shape as the steel sheet pile 5. However, from the viewpoint of extending the joint 5a of the steel sheet pile 5 to above the water, at least the guide section 110a of the

attachment main body 110 may have the same shape as the joint 5a of the steel sheet pile 5.

[0065]

In addition, for example, in the first embodiment, a case has been described where the continuous wall installing attachment 100 is attached to the combined steel sheet pile 4 configured to include the hat-shaped steel sheet pile 5 and the H-section steel 6. In the second embodiment, a case has been described where the continuous wall installing attachment 200 is attached to the combined steel sheet pile 8 configured to include the hat-shaped steel sheet pile 5 and the T-section steel 7. However, for example, the hat-shaped steel sheet pile 5 may be a U-shaped steel sheet pile, a Z-shaped steel sheet pile, or a straight steel sheet pile. In addition, without being limited to the H-section steel 6 or the T-section steel 7, an L-section steel may be used, for example. In this case, the continuous wall installing attachment may be manufactured in accordance with a shape and a structure of the combined steel sheet pile.

[Example]

[0066]

Next, an example of the present invention will be described. However, a condition according to the example shows one condition example employed in order to verify applicability and an advantageous effect of the present invention. The present invention is not limited to the one condition example. The present invention can employ various conditions as long as the conditions do not depart from the gist of the present invention and can achieve the object of the present invention.

[0067]

The continuous wall installing attachment 100 shown in FIG. 1A was manufactured. As shown in FIG. 2A, the continuous wall installing attachment 100 was attached to the combined steel sheet pile 4. Then, the combined steel sheet pile 4 was installed on the ground level in the water by causing a chuck of a vibratory hammer to grip the upper end portion of the web section 6b of the H-section steel 6.

[0068]

Next, the combined steel sheet pile 4 having the other continuous wall installing attachment 100 attached thereto was installed from above the water so that the joint 5a was connected to the guide section 110a of the previously installed continuous wall installing attachment 100 and subsequently to the joint 5a of the continuous wall installing attachment 100. After the installation, the continuous wall installing attachment 100 was detached and lifted from the previously installed combined steel

sheet pile 4.

[0069]

The continuous wall was installed in the water by repeatedly carrying out the above-described installation work for the combined steel sheet pile 4 and the lifting work for the continuous wall installing attachment 100. When the continuous wall was installed in the water, without any connecting problems in the joint of the steel sheet pile, the multiple combined steel sheet piles 4 were smoothly and progressively installed.

[Industrial Applicability]

[0070]

According to the present invention, it is possible to provide a continuous wall installation method by which a continuous wall including multiple steel sheet piles can be inexpensively and easily installed in water, and to provide a continuous wall installing attachment which is suitably used for the continuous wall installation method.

[Brief Description of the Reference Symbols]

[0071]

- 1: QUAY
- 2: PIER
- 3: GROUND
- 4: COMBINED STEEL SHEET PILE
- 5: STEEL SHEET PILE (HAT-SHAPED STEEL SHEET PILE)
- 5a: JOINT OF STEEL SHEET PILE (CONNECTING SECTION)
- 5b: ARM SECTION OF STEEL SHEET PILE
- 5c: WEB SECTION OF STEEL SHEET PILE
- 5d: FLANGE SECTION OF STEEL SHEET PILE
- 6: H-SECTION STEEL (COLUMN)
- 6a: FLANGE SECTION OF H-SECTION STEEL
- 6b: WEB SECTION OF H-SECTION STEEL
- 7: T-SECTION STEEL (COLUMN)
- 7a: FLANGE SECTION OF T-SECTION STEEL
- 7b: WEB SECTION OF T-SECTION STEEL
- 8: COMBINED STEEL SHEET PILE
- 9: CONTINUOUS WALL
- 10: WELD
- 20: CRANE
- 30: WIRE

100: CONTINUOUS WALL INSTALLING ATTACHMENT (FIRST EMBODIMENT)

110: ATTACHMENT MAIN BODY OF CONTINUOUS WALL INSTALLING ATTACHMENT

110a: GUIDE SECTION OF CONTINUOUS WALL INSTALLING ATTACHMENT

110b: ARM SECTION OF CONTINUOUS WALL INSTALLING ATTACHMENT

110c: WEB SECTION OF CONTINUOUS WALL INSTALLING ATTACHMENT

110d: FLANGE SECTION OF CONTINUOUS WALL INSTALLING ATTACHMENT

111: BOLT HOLE

112: LIFTING HOLE

113: THROUGH-HOLE (DRAIN HOLE)

120: POSITIONING MEMBER

130: FIXING TOOL

130a: BOLT

130b: NUT

131: BOLT HOLE

140: L-SHAPED PLATE (POSITIONING MEMBER)

150: ROUND STEEL BAR (POSITIONING MEMBER)

180: WEDGE

182: WEDGE RECEIVER

190: INVERTED V-SHAPED PLATE

200: CONTINUOUS WALL INSTALLING ATTACHMENT (SECOND EMBODIMENT)

210: BOLT HOLE PLATE

220: HOLDING SECTION (POSITIONING MEMBER)

H: HEIGHT OF CONTINUOUS WALL INSTALLING ATTACHMENT

W: WIDTH OF CONTINUOUS WALL INSTALLING ATTACHMENT

h: HEIGHT (LENGTH) FROM UPPER END OF STEEL SHEET PILE TO UPPER END OF H-SECTION STEEL

d: WIDTH OF STEEL SHEET PILE (DISTANCE BETWEEN JOINTS (CONNECTING SECTIONS))

[Document Type]

CLAIMS

1. A continuous wall installation method by which a continuous wall is constructed by installing multiple steel sheet piles having connecting sections in water while the connecting sections are connected to each other, the method comprising:

a first attachment connection process of connecting a continuous wall installing attachment having a guide section which has the same shape as the connecting section to the steel sheet pile so that the guide section is joined to the connecting section;

a first installation process of installing the steel sheet pile after the first attachment connection process in the water so that a portion of the guide section of the continuous wall installing attachment appears above the water surface;

a second installation process of installing the other steel sheet pile in the water while the connecting section of the other steel sheet pile is connected to the guide section of the continuous wall installing attachment and subsequently to the connecting section of the steel sheet pile, after the first installation process; and

an attachment detaching process of detaching the continuous wall installing attachment from the steel sheet pile, after the second installation process, wherein

a column is fixed to the steel sheet pile in advance, and the other column is fixed to the other steel sheet pile in advance, and

the steel sheet pile is installed by applying an installing drive force to the column during the first installation process, and the other steel sheet pile is installed by applying an installing drive force to the other column during the second installation process.

2. The continuous wall installation method according to Claim 1, further comprising:

a second attachment connection process of connecting the other continuous wall installing attachment having a guide section which has the same shape as the connecting section of the other steel sheet pile to the other steel sheet pile so that the guide section of the other continuous wall installing attachment is joined to the connecting section of the other steel sheet pile, before the second installation process.

3. A continuous wall installing attachment which is used when a continuous wall is constructed by installing multiple steel sheet piles having connecting sections in the water while the connecting sections are connected to each other, the attachment comprising:

an attachment main body that has a width which is smaller than a distance between the connecting sections respectively disposed in one side edge and the other side edge of the steel sheet pile;

a guide section that is disposed in the attachment main body, and that has the same shape as the connecting section; and

a positioning member that is disposed in the attachment main body, and that positions the attachment main body for the steel sheet pile so that the guide section is joined to the connecting section, when being connected to the steel sheet pile,

wherein the continuous wall installing attachment is attachable to and detachable from the steel sheet pile,

and wherein the continuous wall installing attachment further comprises a fixing section that is detachably fixed to a column which is fixed to the steel sheet pile and applied an installing drive,

and wherein the column projects upward from the attachment main body in a material axis direction of the steel sheet pile.

4. The continuous wall installing attachment according to Claim 3,

wherein a through-hole for passing from one surface through the other surface of the attachment main body is disposed in the attachment main body.