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(54) **A method for driving a sheet pile wall into the ground as well as a sheet pile to be used therewith**

Methode zum Einrammen einer Spundwand in den Boden und Bohle für deren Anwendung

Méthode pour enforcer une paroi de palplanches dans le sol et palplanche pour mise en oeuvre

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Description

The invention relates to a method for driving a sheet pile wall into the ground as defined in the first part of claim 1.

Such a method, with which in general pile sheets of steel having a trapezoidal cross-section are used, is disclosed in NL-A-8602762. The driving of the pile sheets is generally effected by hammering or vibration.

With this well-known method the strip welded to the pile sheet and extending therefrom has a bend, such, that the first part of the strip extends from the respective wall part of the pile sheet under a relatively steep angle and the second part of the strip extends from the bend towards and along the outer side of the guiding groove to bear on said outer side under a certain pretension.

With this well-known method it is the major object to create a circumferentially closed hollow chamber at the longitudinal edge formation comprising the guiding groove, said hollow chamber being filled with a sealing substance prior to driving the next sheet pile onto the ground. Driving of the next pile sheet causes the free longitudinal edge portion of the deformable strip to slightly move away from the longitudinal edge formation of the driven pile sheet so as to become engaged with a wall portion of the pile sheet being driven that is turned away from the driven pile sheet. The force exerted by the free longitudinal edge portion of the deforming strip onto the longitudinal edge formation has a direction which substantially falls within the vertical plane of the pile sheet wall.

The invention aims at providing an improvement of this well-known method.

According to the invention this aim is achieved by the measures as defined in the second part of claim 1.

By having the deformable strip extend straight to the adjacent longitudinal edge of the guiding groove the chance on getting derailed of the next pile sheet to be driven is substantially decreased.

This is due to the fact that when driving the next pile sheet the strip slightly moving from the guiding groove will engage the backside of the longitudinal groove formation of said next pile sheet, so that the force applied by the strip onto said backside will be directed substantially perpendicular to the vertical plane of the sheet pile wall, i.e. in a direction opposite to the direction in which the next pile sheet under consideration would tend to become derailed.

Moreover the strip fastened in accordance with the method of the present invention provides for a really effective use of a sealing substance and thereby obtaining a 100% leakproof sheet pile wall, because the strip according to the invention also tends to effectively trap the sealing substance within the guiding groove, due to which the substance will be distributed uniformly around the incoming free longitudinal edge of the next pile sheet and will also uniformly flow outwardly between the free edge portion of the strip and the opposite groove bottom

portion of said next pile sheet.

Instead of applying the strip "on the site", just prior to driving the respective sheet piles into the ground, application in the factory will of course also be possible. Therefore the present invention also relates to a sheet pile as defined in the first part of claim 3.

In accordance with the present invention the pile sheet is characterized by the features as defined in the second part of claim 3.

It is to be remarked that document FR-A-2197439 discloses an assembly of two sheet piles in mutual engagement, wherein in the dihedral angle between the two interlocking edge formations of the sheet piles - on the earth side of the pile sheets of the formed pile sheet - a sealing assembly is provided. The well-known sealing assembly comprises a profiled sealing element of rubberlike material, having a first resilient sealing lip to sealingly engage a body wall portion of one of the two interlocking sheet piles, and a second resilient sealing lip to sealingly engage a wall portion of the edge formation of the second sheet pile. The sealing element is kept in place by a metallic covering strip that is fastened, by means of a flange extending along one of its longitudinal edges, to the body wall of the first sheet pile and extends with its free longitudinal edge towards the opposite wall portion of the edge formation of the second sheet pile.

As is indicated in the document this well-known sealing assembly is to be put into place (i.e. in the respective dihedral angle) only after the sheet piles have been driven into the ground.

The invention will be hereinafter further explained by way of example with reference to the accompanying drawing.

Fig. 1 shows a cross-sectional view of a pile sheet of steel, which is provided at one of its longitudinal edges with a deformable strip in accordance with the present invention;

fig. 2 shows a cross-sectional view of the mutual engagement of two adjacent pile sheets with one deformable strip;

fig. 3 is a cross-sectional view as shown in fig. 2, but with a deformable strip on both sides of the sheet pile connection and

fig. 4 is a perspective view, showing how a strip provided on a pile sheet already driven into the ground, is being deformed during driving of a next pile sheet.

With reference to the drawing (fig. 1) A designates a pile sheet of a common type having a trapezoidal cross-section. The longitudinal edge formations indicated at 1 comprise a catching and guiding groove with an undercut cross-section. The free, thickened longitudinal edges of the groove are indicated at 3.

The longitudinal edge formations 1 shown in the drawing enable to have the pile sheet A enter into engagement with a second, similar pile sheet A' (see the dash lines in fig. 1).

With the pile sheet A shown in fig. 1 a strip 3 of e.g. steel plate is fastened, by welding, with one longitudinal edge - at 6 - on the outer side of the right hand oblique trapezium side 5. The strip 4 extends across the guiding groove 2 and bears with its free longitudinal edge portion 4a turned away from the fastening weld 6 on or substantially on the free longitudinal edge 3 of the pile sheet A.

It is assumed that the pile sheet A of fig. 1 represents a pile sheet that has already been driven into the ground, and that a second pile sheet A' is being driven into the ground to the right of pile sheet A, such that the left hand longitudinal edge formation enters into sliding engagement with the right hand longitudinal edge formation of the pile sheet A.

The wall portion 7' forming the bottom of the guiding groove in the left hand longitudinal edge formation of the pile sheet A' will gradually lift the free longitudinal edge portion 4a of the strip 4 off the free longitudinal edge 3 of the pile sheet A - under progressive deformation of the strip 4 - due to which the strip will ultimately become pressed onto the outer side of the wall portion 8 along its entire length (height) (fig. 2).

Fig. 3 shows the case, in which pile sheets are used, which are provided on both longitudinal edges with a guiding groove covering strip. In this case it will also be possible to apply - on one side - a strip along the upper half of a pile sheet and cover the guiding groove on the other side of the pile sheet along the lower half.

The progressive deformation of the strip 3 during driving of the next pile sheet A' is shown in fig. 4.

It will be understood that when e.g. the strip covered guiding groove in the right hand longitudinal edge formation of a previously driven pile sheet has been filled with a sealing substance (for which purpose the guiding groove is closed at the lower end of the pile sheet), said substance will - when the next sheet is being driven on the right side of the previously driven pile sheet - initially be displaced towards the space indicated at 8 and be spread between the engaging surfaces of the respective longitudinal edge formation prior to being expelled at 9.

Claims

1. A method for driving a sheet pile wall into the ground by successively driving sheet piles (A; A') which slidably engage one another by means of complementary longitudinal edge formations (1; 1') that comprise a catching and guiding groove (2; 2'), whereby each time a next sheet pile (A') is lowered with its respective longitudinal edge formation (1') from above into the longitudinal edge formation (1) of a sheet pile (A) that has already been driven into the ground, and whereby each time prior to the driving of a sheet pile (A; A') a deformable strip (4; 4') is applied at at least one of the longitudinal edge formations (1; 1') of such pile (A; A'), said strip (4;

4') being attached with one longitudinal edge to the part of the sheet pile (A; A') that is situated adjacent the guiding groove (2; 2') in said longitudinal edge formation (1; 1'), in such a way, that the strip (4; 4') freely extends across the guiding groove (2; 2') and laterally covers said guiding groove (2; 2') to form a circumferentially substantially closed cavity, which is filled with a sealing substance prior to driving a next pile sheet, characterized in that the strip (4; 4') is fastened to the sheet pile (A; A') in such a position, that it extends from the fastening location straight to the adjacent longitudinal edge (3; 3') of the guiding groove (2; 2'), whereas driving of the next sheet pile (A') causes the free end portion of the strip (4; 4') to gradually deform and release from said adjacent longitudinal edge (3; 3') so as to become engaged with the outer side of the bottom wall portion (7') of the adjoining longitudinal edge formation (1') of said next sheet pile (A').

2. A method according to claim 1, characterized in that a strip (4; 4') is provided at each longitudinal edge formation of each sheet pile (A; A'), said strip (4; 4') covering the respective guiding groove (2; 2') at least along a part of its length or height.
3. A sheet pile (A) comprising a longitudinal edge formation (1) adapted for engagement with a second, similar sheet pile (A') and comprising a groove (2) for catching and guiding the free longitudinal edge (3') of said second sheet pile (A'), wherein at least adjacent one of the longitudinal edge formations (1) of the sheet pile (A) - along at least a part of the length of the pile - a deformable strip (4) is provided which has one of its longitudinal edges fastened to the sheet pile at a location adjacent said longitudinal edge formation (1) and freely extends across the guiding groove (2), in such a way, that the strip (4) laterally covers said guiding groove (2) to form a circumferentially substantially closed cavity, characterized in that the strip (4) is extending from the fastening location on the sheet pile (A) straight towards and against or substantially against the adjacent longitudinal edge (3) of the guiding groove (2).

Patentansprüche

1. Verfahren zum Eintreiben einer Spundbohlenwand im Boden, indem nacheinander Spundbohlen (A; A') eingetrieben werden, welche gleitend ineinandergreifen mittels komplementär geformten Längsrandformationen (1; 1') welche eine Auffang- und Führungsnut (2; 2') aufweisen, wobei jeweils eine weitere Spundbohle (A') mit ihrer betreffenden Längsrandformation (1') von oben her in die entsprechende Längsrandformation (1) einer bereits im Boden getriebenen Spundbohle (A) herunterge-

bracht wird und wobei jeweils vor dem Eintreiben einer Spundbohle (A; A') ein verformbarer Streifen (4; 4') an mindestens einer der Längsrandformationen (1; 1') jener Spundbohle (A; A') angebracht wird, welcher Streifen mit einem Längsrand auf dem der Führungsnut (2; 2') in der Längsrandformation (1; 1') benachbarten Teil der Bohle (A; A') befestigt wird, in der Weise, dass sich der Streifen (4; 4') frei über die Führungsnut (2; 2') erstreckt und diese Führungsnut (2; 2') seitlich überdeckt unter Bildung eines ringsherum geschlossenen Hohlraums, welcher vor dem Eintreiben einer weiteren Bohle mit einem Dichtungsmittel ausgefüllt wird, dadurch gekennzeichnet, dass der Streifen (4; 4') in einer derartigen Position an der Spundbohle (A; A') befestigt wird, dass er sich von der Befestigungsstelle gerade zum benachbarten Längsrand (3; 3') der Führungsnut (2; 2') erstreckt, wobei das Eintreiben der nächsten Spundbohle (A') bewirkt, dass der freie Endteil des Streifens (4; 4') allmählich verformt, dabei vom benachbarten Längsrand (3; 3') freikommt und mit der Aussenseite des Bodenteils (7') der angrenzenden Längsrandformation (1) jener nächsten Spundbohle (A') in Kontakt gelangt.

2. Verfahren nach Anspruch 1, dadurch gekennzeichnet, dass an jeder Längsrandformation jeder Spundbohle (A; A') ein Streifen (4; 4') vorgesehen ist, welcher Streifen (4; 4') die betreffende Führungsnut (2; 2') über wenigstens ein Teil ihrer Länge (Höhe) überdeckt.

3. Spundbohle (A), mit einer Längsrandformation (1) zum Eingreifen in einer zweiten, ähnlichen Spundbohle (A') und versehen mit einer Nut (2) zum Aufnehmen und Führen des freien Längsrandes (3') jener zweiten Spundbohle (A'), wobei an wenigstens einer der Längsrandformationen (1) der Spundbohle (A) - über wenigstens ein Teil der Länge der Bohle - ein verformbarer Streifen (4) vorgesehen ist, welcher mit einem seiner Längsränder an einer der genannten Längsrandformation (1) benachbarten Stelle an der Spundbohle befestigt ist und sich frei über die Führungsnut (2) erstreckt, dadurch gekennzeichnet, dass sich der Streifen (4) von der Befestigungsstelle her gerade zum benachbarten Längsrand (3) der Führungsnut (2) erstreckt und am letzteren anliegt oder nahezu anliegt, in der Weise, dass der Streifen (4) die Führungsnut (2) seitlich überdeckt unter Bildung eines ringsherum geschlossenen Hohlraumes.

Revendications

1. Procédé pour enfoncer une paroi en palplanches dans le sol par enfoncement successif de palplanches (A; A') qui s'emboîtent par coulissement au

moyen de structures de bord longitudinal complémentaires (1; 1') comprenant une rainure d'accrochage et de guidage (2; 2'), une palplanche suivante (A') étant chaque fois abaissée avec sa structure de bord longitudinal (1') respective descendant dans la structure de bord longitudinal (1) d'une palplanche (A) qui a déjà été enfoncée dans le sol, et, avant l'enfoncement d'une palplanche (A; A'), une bande déformable (4; 4') étant chaque fois appliquée au niveau d'au moins une des structures de bord longitudinal (1; 1') d'une telle palplanche (A; A'), ladite bande (4; 4') étant attachée avec un bord longitudinal à la partie de la palplanche (A; A') qui est adjacente à la rainure de guidage (2; 2') dans ladite structure de bord longitudinal (1; 1'), d'une manière telle que la bande (4; 4') s'étend librement à travers la rainure de guidage (2; 2') et recouvre latéralement ladite rainure de guidage (2; 2') pour former une cavité substantiellement fermée circonférentiellement, laquelle est remplie d'une substance d'étanchéité avant l'enfoncement d'une palplanche suivante, caractérisé en ce que la bande (4; 4') est fixée à la palplanche (A; A') dans une position telle qu'elle s'étend directement de l'endroit de fixation jusqu'au bord longitudinal adjacent (3; 3') de la rainure de guidage (2; 2'), tandis que l'enfoncement de la palplanche suivante (A') amène la portion d'extrémité libre de la bande (4; 4') à se déformer progressivement et à se dégager dudit bord longitudinal adjacent (3; 3') de manière à s'emboîter avec le côté extérieur de la portion de paroi inférieure (7') de la structure de bord longitudinal voisine (1') de ladite palplanche suivante (A').

2. Procédé selon la revendication 1, caractérisé en ce qu'une bande (4; 4') est prévue au niveau de chaque structure de bord longitudinal de chaque palplanche (A; A'), ladite bande (4; 4') recouvrant la rainure de guidage (2; 2') respective, au moins le long d'une partie de sa longueur ou de sa hauteur.

3. Palplanche (A) comprenant une structure de bord longitudinal (1) adaptée pour s'emboîter avec une deuxième palplanche (A') similaire, et comprenant une rainure (2) pour accrocher et guider le bord longitudinal libre (3') de ladite palplanche (A'), dans laquelle de manière adjacente au moins à l'une des structures de bord longitudinal (1) de la palplanche (A) - le long d'au moins une partie de la longueur de la palplanche - une bande déformable (4) est prévue, l'un des bords longitudinaux de laquelle étant fixé à la palplanche à un endroit adjacent à ladite structure de bord longitudinal (1), et s'étend librement à travers la rainure de guidage (2) d'une manière telle que la bande (4) recouvre latéralement ladite rainure de guidage (2) pour former une cavité substantiellement fermée circonférentiellement, caractérisée en ce que la bande (4) s'étend

directement de l'endroit de fixation sur la palplanche (A) vers, et contre ou substantiellement contre, le bord longitudinal adjacent (3) de la rainure de guidage (2).

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