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(54) A method for driving a sheet pile wall

(57) The invention relates to a method for driving a sheet pile wall by successively driving sheet piles, of which the profiled longitudinal edges are slidingly engaging one another, into the ground, wherein sheet piles are driven, which are provided below, at the free longitudinal edge, with a mechanical detection means within a lock space confined by said longitudinal edge, said detection means being connected to a line extending upwardly along the outer side of the lock space. According to the invention a pin member is used as a detection means, said pin member extending axially from below into the respective lock space and is received therein completely within the inner circumscription of said lock space, in which it is secured by a break-connection, the lower end of the pin projecting downwardly beyond the lower end of the respective sheet pile and being connected to the upwardly extending line.

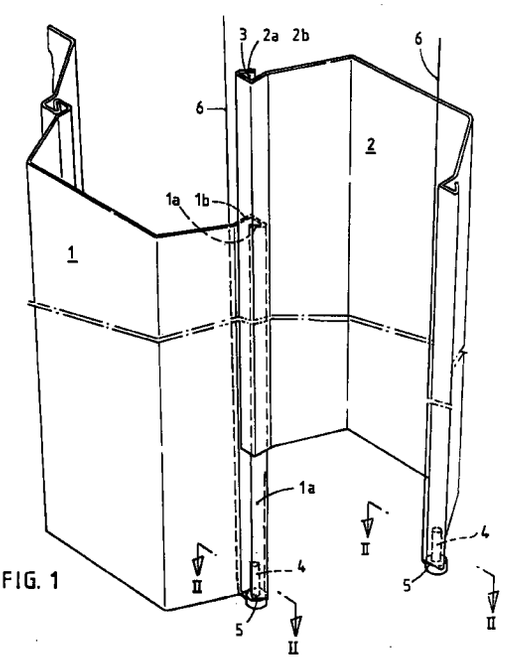

FIG. 1

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Description

The invention relates to a method for driving a sheet pile wall by successively driving sheet piles, of which the profiled longitudinal edges are slidingly engaging one another, into the ground, wherein sheet piles are driven, which are provided below, at the free longitudinal edge, with a mechanical detection means within a lock space confined by said longitudinal edge, said detection means being connected to a line extending upwardly along the outer side of the lock space.

Such a method is known from EP-A-0431710. In the embodiment according to fig. 2a-2b of this document the detection means is formed by a portion of the upwardly extending line that extends across the lock space. Now, when a next sheet pile, while being driven, will remain properly engaged with the sheet pile driven before (i.e. "will remain properly running in the lock"), a moment will come at which the line portion extending across the lock space of the foregoing driven sheet pile is engaged by the driving sheet pile and will be either broken or taken along downwardly. Both of these possibilities can be observed at the portion of the line that extends above groundlevel and are a sign that the last driven sheet pile has become "properly engaged in the lock".

A drawback of this procedure is, that the line portion functioning as a detection means may be damaged or even broken during driving of the respective sheet pile due to foreign matter entering into the open lower end of the lock space during driving. As a consequence of this no properly working detection means will be present when a next sheet pile is driven.

In the embodiment according to fig. 8 of the above document use is made of a detection means that fits in the lock space of a driven sheet pile and extends from said lock space through a slit of said lock space outwardly, said detection means being inserted simultaneously with the driving of the next sheet pile. As long as there exists contact between the lower end of the next driven sheet pile and the detection means lowering through the lock space of the last driven sheet pile the upwardly extending line will be further pulled into the ground as a sign, that the next pile is still "running in the lock". It is a drawback of this procedure, that an "escape from the lock" of the next sheet pile will be detected in a very late stage, viz. only after the engagement with the last driven sheet pile has completely disappeared, because only then the contact between the sheet pile being driven and the detection means will be completely interrupted. This means that successively driven sheet piles may - in spite of a positive detection - still and more particular-ly at the lower end have run out the lock in a considerable measure.

It is an object of the invention to meet with these drawbacks.

According to the invention this aim is achieved in that a pin member is used as a detection means, said pin member extending axially from below into the respective lock space and is received therein completely within the inner circumscription of said lock space, in which it is secured by a break-connection, the lower end of the pin projecting downwardly beyond the lower end of the respective sheet pile and being connected to the upwardly extending line.

As with the first embodiment of the well-known method above discussed, the detection means used with the method of the present invention is premounted with each sheet pile to be driven in the lower end portion of the lock space confined by the free longitudinal edge of such sheet pile. The pin shaped detection means used with the method according to the invention, however, has a better resistance to being damaged during the driving of the respective sheet pile. As compared with the above discussed second embodiment of the well-known method the method according to the invention has the advantage, that no portion of the detection pin is projecting from the lock space via the lock slit outwardly, due to which a more reliable detection is obtained.

It is to be remarked, that NL-A-9102123 discloses a method of the type above referred to, with which the detection means consists of a pin, which is introduced through a hole in a side wall of the lock space. The portion of the pin that extends into the lock space, is thickened and bears on the inner side of said lock space-side wall, whereas the thinner pin portion, that is partly located in the lock space-side wall and partly extends therefrom outwardly, has its free end fastened to the upwardly extended detection line. The thicker pin portion is intended to be sheared off by a next sheet pile that properly runs in the lock, so as to allow the thinner pin portion to escape laterally out of the hole in the lock space-side wall and to be pulled upwardly. In order to facilitate the lateral escape of the thinner pin portion a precompressed helical spring is provided around said pin portion. However, the soil around the lower end of the sheet pile may have such a degree of compactness, that such spring may be prevented from urging the broken-off pin portion to laterally escape. Consequently, the detection so obtained cannot be considered reliable.

In a preferred embodiment of the invention use is made of a detection pin, which has a thickened head at its lower end, said head engaging the lower edge of the sheet pile around said lock space.

In a practical embodiment the break-connection is formed by one or more tack welds.

The invention also relates to a sheet pile for use with the above method.

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

Fig. 1 is a perspective view, illustrating the driving of a sheet pile in accordance with the method of the invention;

fig. 2A is a cross-sectional view, along the line II-II, in which a second sheet pile, which "runs in the lock", is indicated by dash-dotted lines;

fig. 2B is a cross-section as shown in fig. 2A, in which dash-dotted lines designate a second sheet pile, which is about to "run out of the lock";

fig. 3 shows a preferred embodiment of the connection between the detection pin and the detection line connected therewith;

fig. 4 is a perspective view of a sleeve that is clamped on the end of a steel wire cable and is functioning as a detection pin and

fig. 5 is a cross-section through the lower end of a sheep pile and a detection pin of fig. 4 inserted therein.

In fig. 1 two trapezium-shaped sheet piles are illustrated in a diagrammatic manner and indicated by the reference number 1 and 2; the sheet pile 1 has already been driven to the desired depth into the ground, whereas the sheet pile 2 has to be driven further.

The sheet piles 1 and 2 have their longitudinal edges 1a and 2a respectively in mutual engagement in a well-known manner.

Along the free longitudinal edge 1a of the sheet pile 1, i.e. the longitudinal edge, which has to be brought into engagement with the adjacent longitudinal edge 2a of the next sheet pile 2 to be driven, there is provided a "lock space" 3. In the lower end of this lock space, which has a substantially triangular cross-section, a pin 4 is introduced. In the example shown this pin has a cylindrical shaft corresponding with the inscribed cylinder of the lock space 3.

The pin 4 has an enlarged head 4a, which bears on the lower edge portion of the respective sheet pile surrounding the lock space.

The pin 4, which may e.g. be placed "on the spot", is locked against falling out by means of one or more tack welds 5 and is attached to a detection line, e.g. a steel wire cable, which is anchored to (in) the head 4a and extends upwardly along the outer side of the lock space wall 1b (vide fig. 2).

Fig. 2A illustrates the case, in which the sheet pile 2 is "properly engaged" and will - while driving is continued - get with the lower end of its longitudinal edge 2a in engagement with the upper end of the detection pin 4, as a result of which the latter will finally expelled from the lower end of the lock space 3 of the pile sheet 1, while the tab weld(s) 5 are broken off. This situation can be observed aboveground through the detection line 6 becoming slack.

Fig. 2B illustrates the case, in which the sheet pile 2 has partially "run out of the lock" and will - while continuing driving - remain just out of engagement with the detection pin 4, as a result of which the latter will remain into the lower end of the lock space 3 of the last driven sheet pile 1.

This situation can be observed aboveground through the detection line 6 being kept tensioned.

In the event the second sheet pile to be driven has a shorter length than the first driven sheet pile 1, so that the lower end of the second sheet pile will not reach the detection pin within the lock space of the driven sheet pile, the difference in length may be compensated by a filling rod of a corresponding length which is dropped into the lock space of the driven sheet pile.

In the diagrammatic embodiment according to fig. 1 and 2 the detection line 6 is anchored in the centre of the lower end face of the detection pin 4. As an alternative the detection line could be anchored diametrically through the enlarged head 4a of the detection pin 4.

A preferred embodiment of the connection between the detection line 6 and the detection pin 4 is shown in fig. 3. In this embodiment at least the lower part of the detection line 6 is formed by a linked chain 7, the last link 7a of which engages the cylindrical shaft of the detection pin 4 and will become captured betweed the lower edge of the sheet pile and the enlarged head 4a when the pin 4 is placed into the lower end of the lock space 3. The connection of fig. 3 is able to withstand the forces that are applied to it when driving the respective sheet pile whereas upon expelling of the detection pin 4 the detection line will easily get released therefrom to be pulled upwardly.

In the very simple and effective embodiment according to fig. 4 and 5 use is made of a detection pin in the form of a metal sleeve 4' which is clamped on the distal end of a steel wire cable 6' functioning as a detection line. This sleeve may be readily clapped onto the cable 6' by means of a simple clamping tool and is secured in the lock space 3 by means of one or more tack welds 5, which are provided via the lock space slit 3a.

Claims

1. A method for driving a sheet pile wall by successively driving sheet piles, of which the profiled longitudinal edges are slidingly engaging one another, into the ground, wherein sheet piles are driven, which are provided below, at the free longitudinal edge, with a mechanical detection means within a lock space confined by said longitudinal edge, said detection means being connected to a line extending upwardly along the outer side of the lock space, characterized in that a pin member is used as a detection means, said pin member extending axially from below into the respective lock space and is received therein completely within the inner circumscription of said lock space, in which it is secured by a break-connection, the lower end of the pin projecting downwardly beyond the lower end of the respective sheet pile and being connected to the upwardly extending line.

2. A method according to claim 1, characterized in that use is made of a detection pin, which has a thickened head at its lower end, said head engaging the lower edge of the sheet pile around said lock space.

3. A method according to claim 1, characterized in that use is made of a detection pin in the form of a sleeve

that is clamped on the distal end of a steel wire cable functioning as a detection line.

4. A method according to claims 1-3, characterized in that the break-connection is effected by providing one or more tack welds.

5. A method according to claims 2 and 4, characterized in that use is made of a line, of which at least the lower part comprises a linked chain, the last link of which engages the shaft of the detection pin and is captured between the enlarged head of the detection pin and the lower edge of the respective sheet pile.

6. Sheet pile, the profiled longitudinal edges of which confine a lock space for engagement with the longitudinal edge of an adjacent sheet pile, characterized in that a detection pin is placed in the lower end of the lock space along one of the longitudinal edges, said detection pin being secured within the lock space by a break-connection and connected to a detection line that is fastened to the detection pin at a location outside the lock space.

7. A sheet pile according to claim 6, characterized in that the detection pin has an enlarged head that bears on the lower edge of the respective sheet pile.

8. A sheet pile according to claims 6-7, characterized in that the detection line consists at least partially of a linked chain, the last link of which engages the shaft of the detection pin and is captured between the lower edge of the respective sheet pile and the enlarged head of the detection pin.

9. A sheet pile according to claim 1, characterized in that use is made of a detection pin in the form of a sleeve that is clamped on the distal end of a steel wire cable functioning as a detection line, said sleeve being secured in the lock space by one or more tack welds.

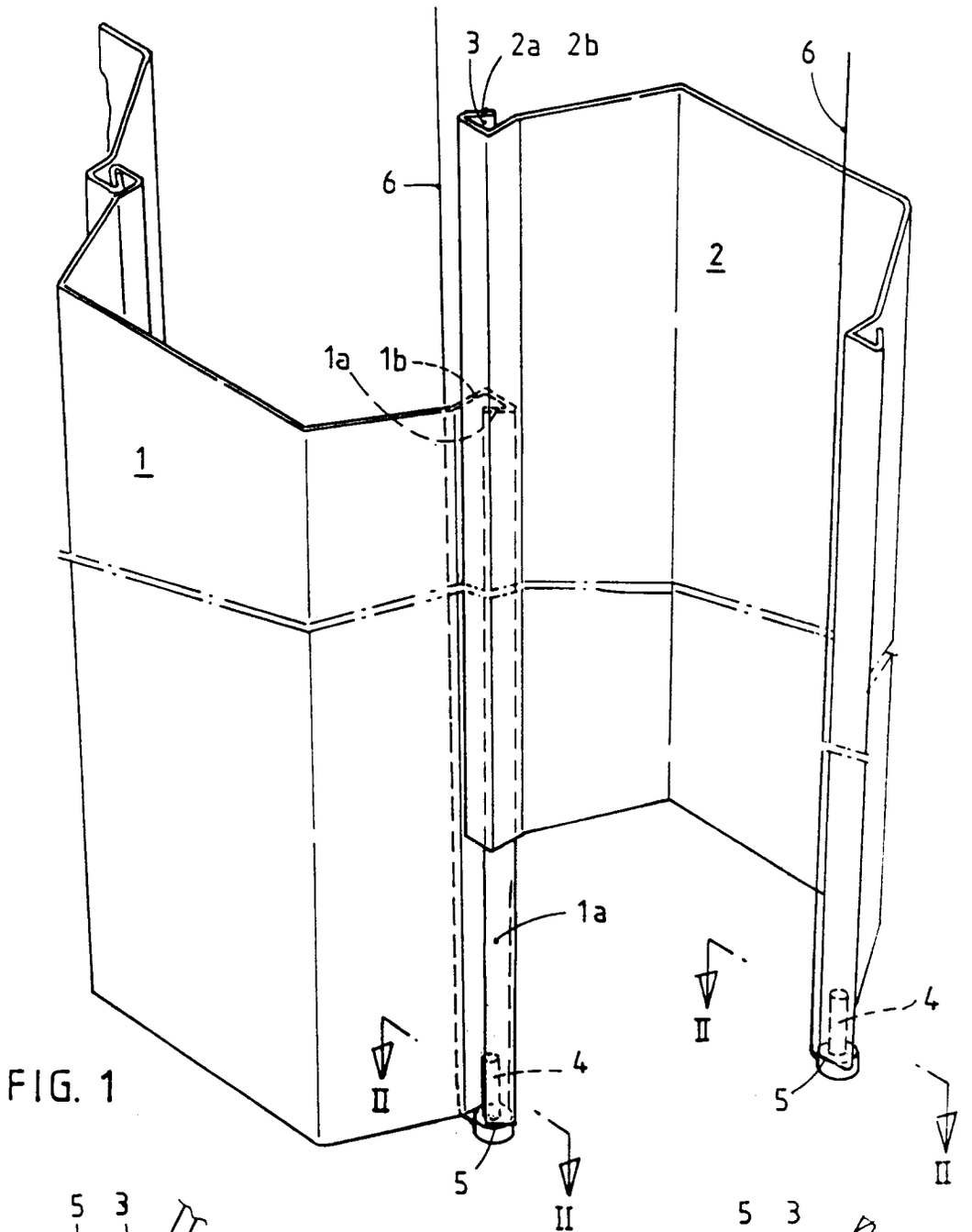

FIG. 1

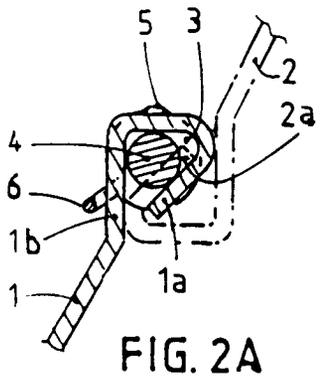

FIG. 2A

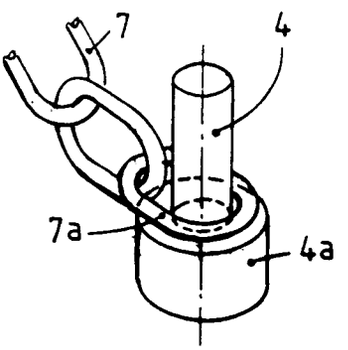

FIG. 3

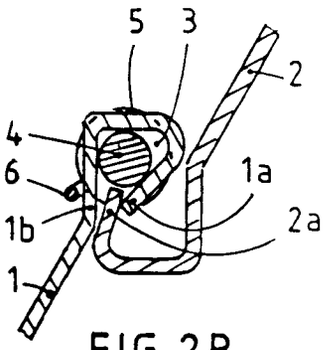

FIG. 2B

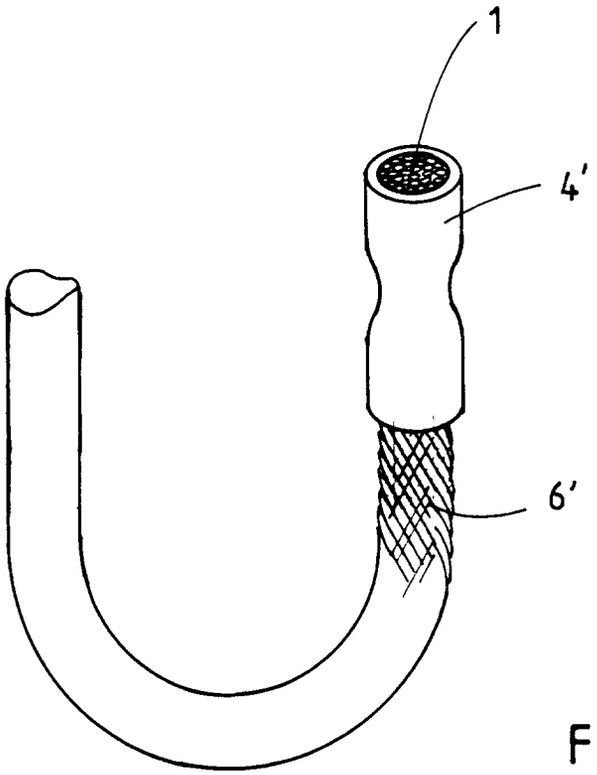

FIG. 4

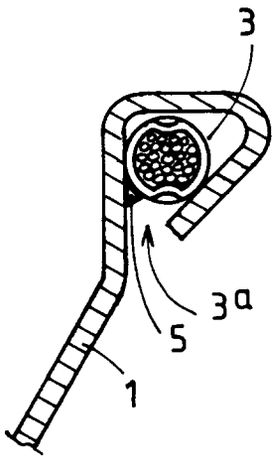

FIG. 5

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EUROPEAN SEARCH REPORT

Application Number
EP 95 20 1649

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
Y	NL-A-7 908 262 (HOLLANDSCHE BETON GROEP N.V.) * page 3, line 16 - line 28; figures 1,2 * ---	1,2,6,7	E02D13/06
Y	NL-A-9 102 123 (AANNEMINGSBEDRIJF ZEIDERVELD-ASSEN B.V.) * page 4, line 25 - page 5, line 25; figures 1,2 * -----	1,2,6,7	
			TECHNICAL FIELDS SEARCHED (Int.Cl.6) E02D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	20 February 1996	Kergueno, J

CATEGORY OF CITED DOCUMENTS

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