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(54) **A method for interlocking a pair of mutually engaging sheet piles of steel**

(57) Two sheet piles having adjacent longitudinal edge profiles in mutual engagement, are interlocked by pressing impressions on at least one side into the mutually engaging longitudinal edges, in a direction at right angles to said edges. According to the invention pressing of the impressions is effected by means of a punch adapted to be operated by a hydraulic percussion hammer.

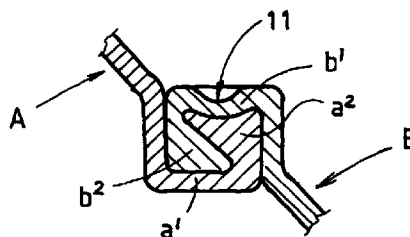


Fig. 2b

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Description

[0001] Driving sheet piles of steel into the ground by hammering, vibration or similar techniques is often taking place in pairs, which means that each time two sheet piles which have been placed in mutual engagement in advance, are simultaneously driven into the ground. It is important that the piles of a pair cannot slide relative to one another during handling and driving.

[0002] The invention relates to a method for interlocking a pair of sheet piles of steel, that engage one another through adjacent longitudinal edge profiles, wherein the pair of sheet piles is supported with the back of one longitudinal edge profile bearing onto a support bed and with the back of the second longitudinal edge profile facing away from the support bed, and wherein an impression is pressed into the back of the second longitudinal profile by means of a punch that is provided with a spherical end and is driven towards the support bed.

[0003] In case of sheet piles intended to be driven into the ground in pairs it has been common practice, which is disclosed in EP-A-0075526, to compose the pairs of sheet piles and to interlock the sheet piles of each pair in the above manner already in the factory. According to the procedure followed up to now, each time a number (e.g. two or four) of impressions mutually spaced by a predetermined pitch in the longitudinal direction are pressed simultaneously by means of a corresponding number of punches, which are operated by the movable section of an hydraulic press. The impressions, which manifest themselves as embosses within the "lock", fill up the existing clearance within the lock first and must then penetrate into the underlying surface of the free longitudinal edge of the longitudinal edge formation of the second sheet pile to obtain the desired interlocking effect.

[0004] To provide each following impression or group of impressions the pair of sheet piles have to be displaced across the support bed through a distance which is equal to the pitch between two impressions, multiplied with the number of impressions in a group.

[0005] As a practical example reference is made to a pair of sheet piles of the type LX 25 having a so-called Lasche-lock, with which the above method was carried out by using a hydraulic press capable of exerting a pressing force of 125 ton per impression, the punch having a spherical end with a radius of 12.5 mm. The depth of the impressions in the approximately 10 mm thick back was equal to the said radius = 12.5 mm.

[0006] The invention aims at providing a method of the type hereinabove, which is particularly adapted to be carried out outside the factory and which is not dependent of the availability of a heavy hydraulic press.

[0007] According to the invention this aim is achieved in that the punch is operated by a drive means of the percussion hammer type.

[0008] Tests with the method of the invention have

been carried out by making use of a percussion hammer which is formed by a hydraulic demolition hammer made by DEHACO, type DHB 805. The percussion cylinder (having a diameter of 100 mm) of the same was extended by a punch section with a spherical end having a radius of 12.5 mm.

[0009] With sheet piles of the type above referred to the desired impression depth (12.5 mm) was reached after a view (three - four) strokes of the percussion device. In comparison with the capacity of the stationary press used with the well-known method, the capacity of the hydraulic demolition hammer used with the test just referred to is a fraction only. Moreover it was found that the successive strokes of the punch results in impressions, which more effectively penetrate into the thickened longitudinal edge underlying the impressed back than with the well-known method. It is assumed that with the well-known method the single punch stroke tends to press the entire thickened longitudinal edge under the impressed back downwardly, after which said longitudinal edge is allowed to spring back.

[0010] According to a further feature of the invention the pair of sheet piles to be interlocked are put in a horizontal position on a fixed support point and the driving means with the punch extending downwardly therefrom is displaced stepwise across the interengaging longitudinal edge profiles to provide a number of longitudinally spread impressions therein, for which purpose the drive means is suspended to the end of an arm, that extends from a carriage which is adapted to be moved laterally along the support back.

[0011] The invention will be hereinafter further explained by way of example with reference to the drawing.

Fig. 1 is a diagrammatic cross-sectional view through a pair of sheet piles of steel, supported in a lying position, with a percussion device having a downwardly extending punch positioned thereabove;

fig. 2A shows a cross-sectional view on an enlarged scale (as compared with fig. 1) through two interengaging longitudinal edge profiles of the sheet pile pair, in the state prior to actuating the punch and fig. 2B shows the same cross-sectional view as shown in fig. 2A, but now in a state after actuation of the punch.

[0012] In fig. 1 three support beams 1, 2 and 3 are shown in a diagrammatic manner, said beams forming together a horizontal support bed for a pair of sheet piles A and B of steel.

[0013] The sheet piles A and B are of a common trapezoidal cross-sectional shape with longitudinal edge profiles a and b formed at the free ends of the oblique legs.

[0014] The longitudinal edge profiles a and b have a back a1 and b1 respectively and a bent, thickened and

wedge-shaped longitudinal edge a2 and b2 respectively.

[0015] Each of the longitudinal edge profiles a and b delimits an (as seen in cross-section) undercut cavity (also called "lock space"), in which the thickened wedge-shaped longitudinal edge b2 (a2) of a longitudinal edge profile b (a) of the second pile B (A) fits. The sheet piles A and B may thus be put in mutual engagement e.g. by displacing sheet pile A longitudinally relative to sheet pile B, while sliding one of the thickened longitudinal edges a2 of sheet pile A into the "lock" space of one of the longitudinal edge profiles b of sheet pile B.

[0016] In fig. 1 the sheet pile pair A, B bears with the back a1 of the mutual engaging longitudinal edge profiles a, b on the central support beam 2, with the back a1 of the free longitudinal edge profile a of sheet pile A bearing on the left support beam 1 and with the thickened wedge-shaped longitudinal edge b2 of the free longitudinal edge profile b of sheet pile B bearing on the right hand support beam 3.

[0017] It will be understood, that the supporting faces of the support beams 1 and 2 are on the same level, whereas the supporting face of support beam 3 is positioned above the support faces of the support beams 1 and 2 to an extent corresponding to the thickness of a back a1 (b1).

[0018] A punch 4 having a semi-spherical shaped free end is taking a vertical position above and on the back b1 of the two interengaging longitudinal edge profiles a, b. The punch 4 is the up and down moving member of the percussion hammer indicated at 5.

[0019] The percussion hammer 5 is e.g. an hydraulic hammer of the type which is e.g. commonly known as demolition hammer. The punch 4 with its semi-spherical end constitutes the operative end of the reciprocating member which in normal use is functioning as a demolition punch.

[0020] The percussion hammer is mounted in a well-known manner onto the end of a partially shown arm 6, that extends from a carriage (not shown), which can be displaced parallel along e.g. the third beam 3.

[0021] Starting from the situation shown in fig. 2A, three or four strokes of the punch 4 will be sufficient to obtain the situation shown in fig. 2B. A semi-spherical impression 11 with a depth corresponding to the radius of the punch tip 4 appears to be formed in the upper back b1. The impression 11 manifests itself on the lower side of back b1 as an embossment and also appears to have resulted in a concave deformation of the upper face of the underlying thickened wedge-shaped longitudinal edge a2.

[0022] By providing a number of such impressions at longitudinally spaced locations an effective interlocking of the two sheet piles A and B may be obtained.

[0023] Tests have shown, that the thus interlocked sheet piles A and B can not be longitudinally moved apart by even relatively large mutually opposite longitudinal forces.

dinal forces.

Claims

1. A method for interlocking a pair of sheet piles of steel, that engage one another through adjacent longitudinal edge profiles, wherein the pair of sheet piles is supported with the back of one longitudinal edge profile bearing on a support bed and with the back of the second longitudinal edge profile facing away from the support bed, and wherein an impression is pressed into the back of the second longitudinal profile by means of a punch that is provided with a spherical end and is driven towards the support bed, characterized in that the punch is operated by a drive means of the percussion hammer type.
2. A method according to claim 1, characterized in that the pair of sheet piles to be interlocked is put in a horizontal position onto a fixed support point and the driving means with the punch extending downwards therefrom is displaced stepwise across the interengaging longitudinal edge profiles to provide a number of longitudinally spread impressions therein, for which purpose the drive means is suspended to the end of an arm, that extends from a carriage which is adapted to be moved laterally along the support back.
3. A method according to claims 1-2, characterized in that use is made of a hydraulic percussion type hammer.

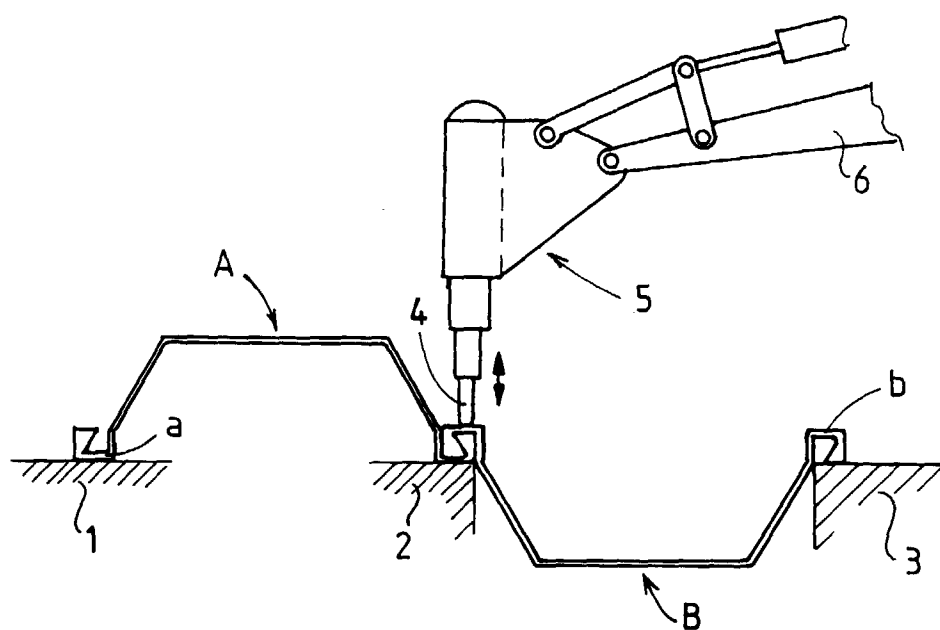


Fig. 1

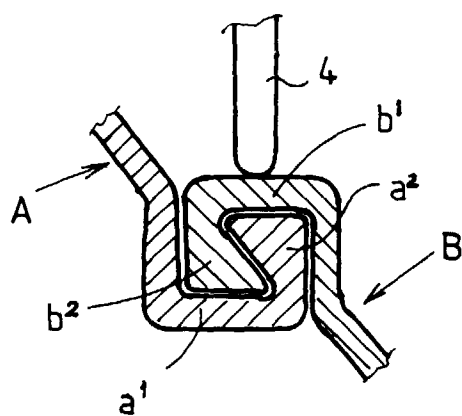


Fig. 2a

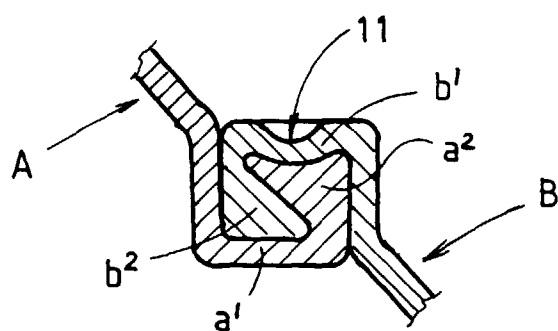


Fig. 2b



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EUROPEAN SEARCH REPORT

Application Number
EP 98 20 2700

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)
D,X	EP 0 075 526 A (ARBED) 30 March 1983 * the whole document * -----	1-3	E02D5/08
			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
			E02D
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 21 September 1998	Examiner Blommaert, S
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**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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21-09-1998

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 0075526 A	30-03-1983	LU 83651 A	08-06-1983