(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 0 633 360 B1

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
13.05.1998 Bulletin 1998/20

(51) Int Cl.[6]: **E02D 5/52**, E04H 12/12

(21) Application number: **94201936.5**

(22) Date of filing: **04.07.1994**

(54) **Pile coupling for prefabricated pile elements made of concrete**

Kupplung für vorgefertigte Betonpfähle

Raccord pour pieux préfabriqué en béton

(84) Designated Contracting States:
BE CH DE LI NL

(30) Priority: **05.07.1993 NL 9301177**

(43) Date of publication of application:
11.01.1995 Bulletin 1995/02

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EP 0 633 360 B1

Printed by Jouve, 75001 PARIS (FR)

Description

The invention relates to a pile coupling for prefabricated pile elements made of concrete, each comprising, at the end to be coupled, a cast-in metal sleeve, which metal sleeves are interconnectable.

For providing foundation piles in the ground, prefabricated pile elements of high-grade concrete can be used, such as for instance disclosed in DE-OS 21.20.691. For reasons of manufacture and transport, the length of these prefabricated pile elements is limited to approximately 20-25 m. If the bearing ground layers are located at a greater depth below the ground level than the length of these conventional, prefabricated pile elements, these pile elements must be coupled in any way so as to form a pile element of a sufficient length.

A pile coupling of the above-described type is known from practice. When a first prefabricated pile element has been driven into the ground for the larger part, a second pile element is coupled thereto by welding together the metal sleeves which are cast in at the ends of the pile elements to be coupled. In itself, such a pile coupling is relatively cheap; however, welding together the cast-in metal sleeves requires quite some time and, moreover, should be carried out while the pile-driving rig is stationary, which is undesired because it is expensive. Moreover, the thus obtained pile coupling has poor resistance to tensile stresses acting on the weld, which may give rise to cracks so that the prefabricated pile elements become loose from each other, which has a very adverse impact on the bearing capacity and the reliability of the thus formed foundation pile.

The object of the invention is to provide a pile coupling of the above-described type, wherein these drawbacks have been overcome. According to the invention, this object is realized by providing a pile coupling in which each sleeve is of a wavy design and has the shape of a solid of revolution and has a length of at least one complete wave period, the wave form at the location of the wave crest on the end face of the pile element being extended over a certain distance, such that when the end faces butt on each other, the distance between the wave troughs located on both sides of the joint face is greater than the wave period, and two half clamping rings, provided with a corresponding, regular wave profile and having a length of at least two wave periods, are clamped around the metal sleeves, the distance between the corresponding wave troughs in the half clamping rings being smaller than the distance between the wave troughs of the metal sleeves, the arrangement being such that the end faces of the pile elements are pressed against each other with pretension.

In this manner, a pile coupling is obtained which is extremely reliable and which, moreover, can be provided very quickly, so that the pile-driving rig will be stationary only for a short period. According to the invention, the prefabricated pile elements to be coupled are pressed against each other with pretension.

It is observed that a pile coupling for prefabricated pile elements is known from GB-A-985,130. The pile elements consist here of helically threaded pile sections, made of steel. The pile coupling comprises a metal outer sleeve, a metal inner sleeve and a resilient liner member of rubber, fixed to the inner sleeve by means of an adhesive. The liner member is pressed radially inwardly into the threads of the pile elements when the inner and outer sleeves are moved in the axial direction relative to each other. The pile coupling does not allow a connection of the pile elements under axial pretension.

One embodiment of the pile coupling according to the invention will be further explained with reference to the accompanying drawings. In these drawings:

Fig. 1 shows two end faces, abutting against each other, of prefabricated pile elements made of concrete, provided with the pile coupling according to the invention;

Fig. 2 shows a detail, in section, of the pile coupling according to Fig. 1; and

Fig. 3 is a side elevation of the pile coupling according to Fig. 1.

Fig. 1 shows the ends of two prefabricated pile elements 1, 1', whose end faces 4, 4' abut against each other. Provided in the two end faces 4, 4' are recesses 12, 12' for accommodating therein a guide dowel 13. Each pile end comprises a cast-in metal sleeve 2, 2', both sleeves having a wavy profile. The wave form 3 is chosen such that it can readily be provided, through a rolling operation, in the sleeves 2, 2'. The wave form 3 is for instance sinusoidal or trapezoidal. The length of each sleeve 2, 2' is at least one complete wave period a, however preferably at least two complete wave periods. By means of anchors 5, 5', the sleeves 2, 2' are anchored in the prefabricated pile elements 1, 1'.

At the location of the joint face 4, 4' of the two pile elements 1, 1', the wave form 3 slightly deviates from the regular wave form. At the wave crest, located in the joint face 4, 4', the wave form is extended over a distance x. This means that the wave troughs 14, 14', located on both sides of the joint face 4, 4', are spaced apart at a distance greater than one complete wave period a and is for instance $S = a + 2x$, the distance x preferably being approximately 0.5-1 mm.

The coupling further comprises two half clamping rings 6, provided with a wave profile 3 corresponding to the wave profile provided in the sleeves 2, 2'. The length of the two half rings approximately corresponds to twice the length of a metal sleeve 2, 2'. At the location of the joint face 4, 4', the wave form of the half clamping rings 6 deviates from the wave form 3 of the sleeves 2, 2' in the sense that the distance between the wave troughs on both sides of the joint face 4, 4' is equal to one wave period a of the wave profile 3 of the sleeves 2, 2' or even somewhat smaller. At the ends, viewed in circumferential direction, each half clamping ring 6 is provided with

clamping blocks 7, secured in the wave troughs by welding and provided with drilled holes 8. For clamping the two ring halves 6 around the sleeves 2, 2', bolts 9 are passed through the drilled holes 8 of the clamping blocks 7 and tightened by means of nuts 10.

As explained hereinabove, the distance between the wave troughs 14, 14' on both sides of the joint face 4, 4' of the two sleeves 2, 2' equals S = a + 2x, while the spacing between the corresponding wave troughs in the half clamping rings 6 is smaller than this distance S. When the two ring halves 6 are placed on the sleeves 2, 2' and, subsequently, the nuts 10 are tightened, the wave troughs 14, 14' of the sleeves 2, 2' are pressed toward each other and the end faces 4, 4' are pressed together forcefully, so that the ends of the prefabricated pile elements will abut against each other with pretension. In this manner, the ends of the pile elements 1, 1' are coupled to each other in a highly reliable manner, so that the coupled pile elements indeed behave like a single, extended pile. The coupling can be arranged considerably more quickly than the time required for welding together the edges of the two metal sleeves 2, 2', so that the pile-driving rig used for making foundation piles is out of operation for a considerably shorter period.

Claims

1. A pile coupling for prefabricated pile elements made of concrete, each comprising, at the end to be coupled, a cast-in metal sleeve (2,2'), said metal sleeves being interconnectable, characterized in that each sleeve (2, 2') is of a wavy design and has the shape of a solid of revolution and has a length of at least one complete wave period (a), the wave form (3) at the location of the wave crest on the end face (4, 4') of the pile element being extended over a certain distance (x), such that when the end faces (4, 4') butt on each other, the distance (a + 2x) between the wave troughs (14, 14') located on both sides of the joint face is greater than the wave period (a), and two half clamping rings (6), provided with a corresponding, regular wave profile (3) and having a length of at least two wave periods (a), are clamped around the metal sleeves (2, 2'), the distance (a) between the corresponding wave troughs in the half clamping rings (6) being smaller (2x) than the distance (a + 2x) between the wave troughs (14, 14') of the metal sleeves (2, 2'), the arrangement being such that the end faces (4,4') of the pile elements (1,1') are pressed against each other with pretension.

2. A pile coupling according to claim 1, characterized in that the metal sleeve (2) is provided with a sinusoidal wave profile having a length of at least two complete wave periods (a).

3. A pile coupling according to claims 1-2, characterized in that at the location of the ends, viewed in circumferential direction, the half clamping rings (6) are provided with clamping blocks (7), secured in the wave troughs by welding and provided with a drilled hole (8).

Patentansprüche

1. Pfahlkupplung für aus Beton vorgefertigte Pfahlelemente, die jeweils an dem zu verbindenden Endabschnitt eine eingegossene Metallbuchse (2,2') aufweisen, wobei diese Metallbuchsen miteinander verbunden werden können,
dadurch gekennzeichnet, daß
diese Metallbuchsen (2, 2') eine wellenförmige Konfiguration und die Form einer stetigen Umlaufrichtung sowie eine Länge haben, welche mindestens einer kompletten Wellenperiode (a) entspricht, und daß sich an der Position der Wellenspitze an der Endfläche (4, 4') des Pfahlelementes die Wellenform (3) über einen gewissen Abstand (x) in einer Weise erstreckt, daß, wenn die Endflächen (4, 4') aneinander anliegen, der Abstand (a + 2x) zwischen den Tälern der Wellen (14, 14'), welche auf beiden Seiten der Verbindungsfläche angeordnet sind, größer ist, als die Wellenperiode (a), und dadurch, daß zwei Spannringhälften (6), welche mit einem entsprechenden gleichmäßigen Wellenprofil (3) ausgestattet sind und eine Länge haben, welche mindestens zwei Wellenperioden (a) entspricht, an der Außenseite der Metallbuchsen (2, 2') verspannt werden, und daß der Abstand (a) zwischen den entsprechenden Wellentälem in den Spannringhälften (6) kleiner (2x) als der Abstand (a + 2x) zwischen den Tälern der Wellen (14, 14') der Metallbuchsen (2, 2') ist, und daß diese Anordnung so gestaltet ist, daß die Endflächen (4, 4') der Pfahlelemente (1, 1') mit Hilfe einer Vorspannung miteinander verpreßt werden.

2. Pfahlkupplung nach Anspruch 1,
dadurch gekennzeichnet, daß
die Metallbuchse (2) mit einem sinusförmigen Wellenprofil ausgestattet ist, welches eine Länge hat, die mindestens zwei kompletten Wellenperioden (a) entspricht.

3. Pfahlkupplung nach einem der Ansprüche 1 bis 2,
dadurch gekennzeichnet, daß
an der Position der in Umfangsrichtung verlaufenden Endabschnitte die Spannringhälften (6) mit Klemmblöcken (7) ausgestattet sind, welche in die Wellentäler eingeschweißt und mit einer Bohrung (8) versehen sind.

Revendications

1. Accouplement de pieux destiné à des éléments préfabriqués de pieu formés de béton, comprenant chacun, à l'extrémité à accoupler, un manchon métallique (2, 2') fixé par moulage, les manchons métalliques pouvant être interconnectés, caractérisé en ce que chaque manchon (2, 2') a une réalisation ondulée et a la forme d'un solide de révolution et une longueur au moins égale à une période complète (a) de l'ondulation, la forme ondulée (3), à l'emplacement de la crête de l'ondulation à la face d'extrémité (4, 4') de l'élément de pieu, étant prolongée sur une certaine distance (x) afin que, lorsque les faces d'extrémité (4, 4') sont en butée l'une contre l'autre, la distance (a + 2x) comprise entre les creux d'ondulation (14, 14') placés des deux côtés de la face de joint soit supérieure à la période (a) d'ondulation, les deux demi-anneaux (6) de serrage, ayant un profil ondulé régulier correspondant (3) et ayant une longueur d'au moins deux périodes (a) de l'ondulation, sont serrés autour des manchons métalliques (2, 2'), la distance (a) comprise entre les creux correspondants d'ondulation formés dans les demi-anneaux (6) de serrage étant inférieure (2x) à la distance (a + 2x) comprise entre les creux (14, 14') de l'ondulation des manchons métalliques (2, 2'), la disposition étant telle que les faces d'extrémité (4, 4') des éléments de pieux (1, 1') sont repoussées l'une contre l'autre avec une force de tension préalable.

2. Accouplement de pieux selon la revendication 1, caractérisé en ce que le manchon métallique (2) a un profil ondulé sinusoïdal dont la longueur est au moins égale à deux périodes complètes (a) de l'ondulation.

3. Accouplement de pieux selon les revendications 1-2, caractérisé en ce que, à l'emplacement des extrémités, vues en direction circonférentielle, les demi-anneaux (6) de serrage ont des blocs de serrage (7) fixés dans les creux des ondulations par soudage et ayant un trou percé (8).

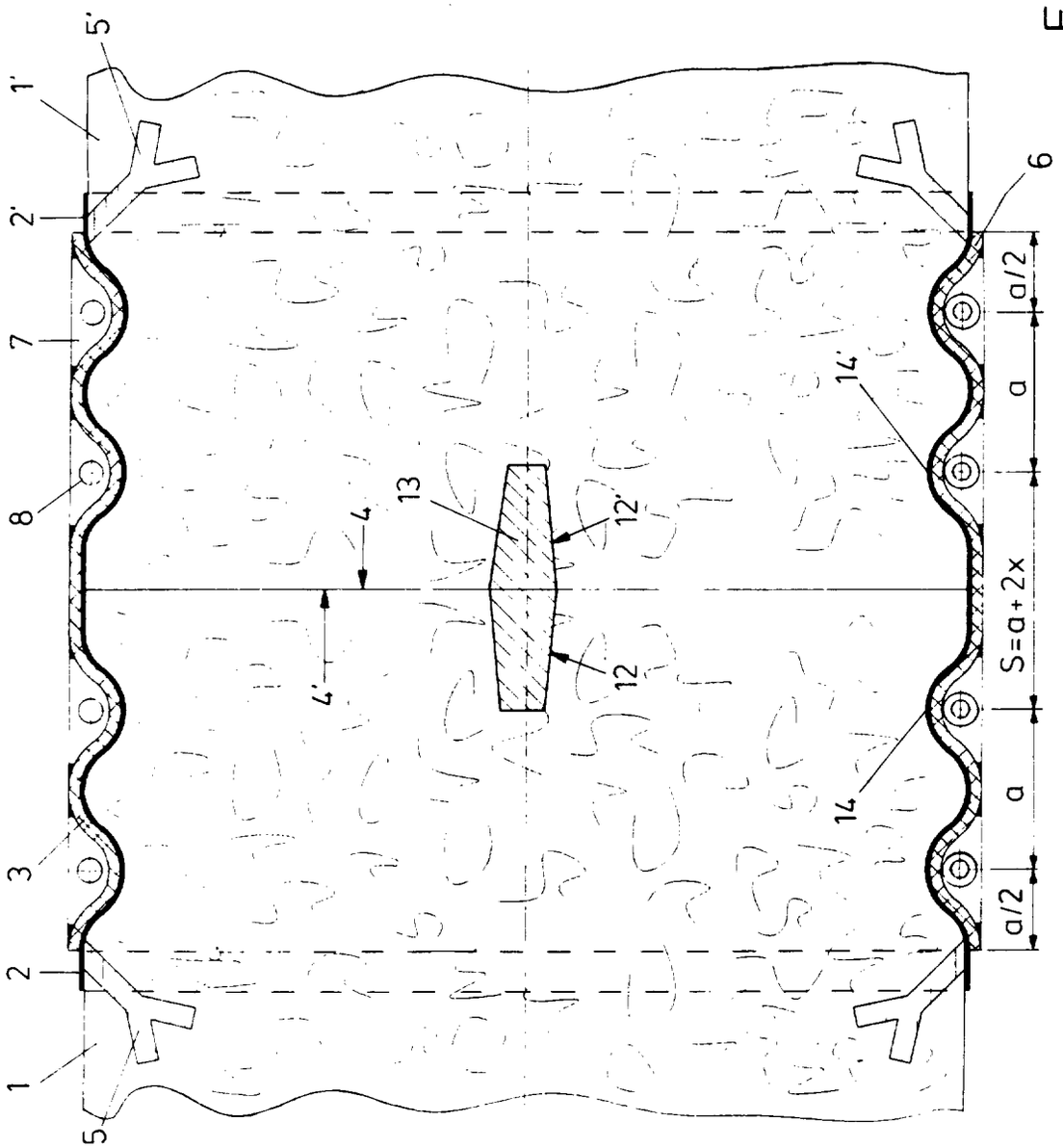

FIG.1

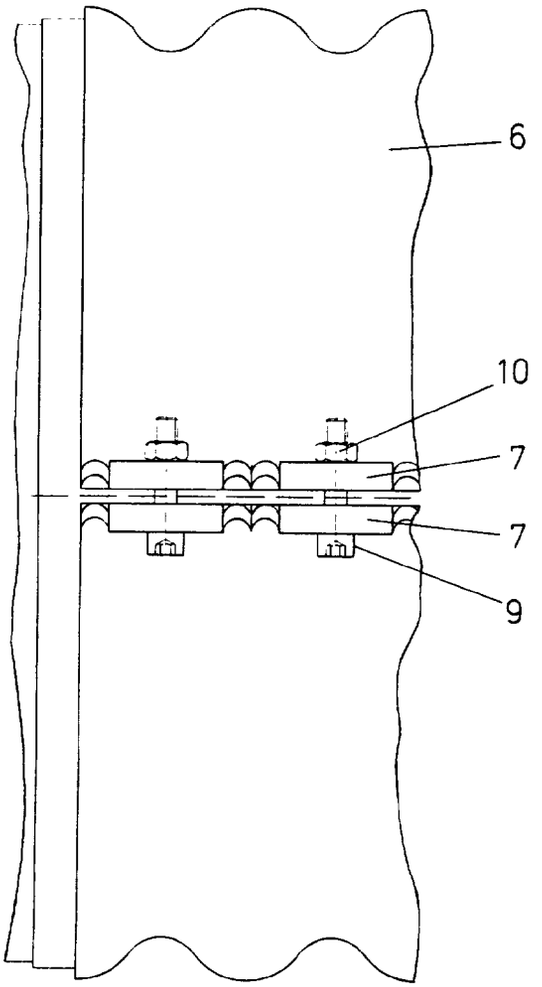

FIG. 3

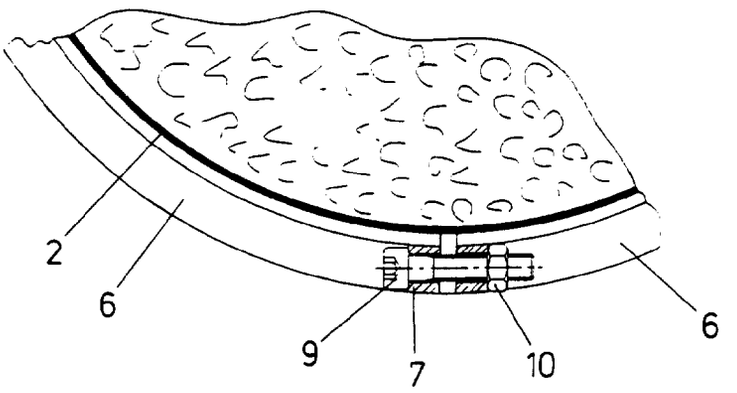

FIG. 2