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CONCRETE PILE JOINT

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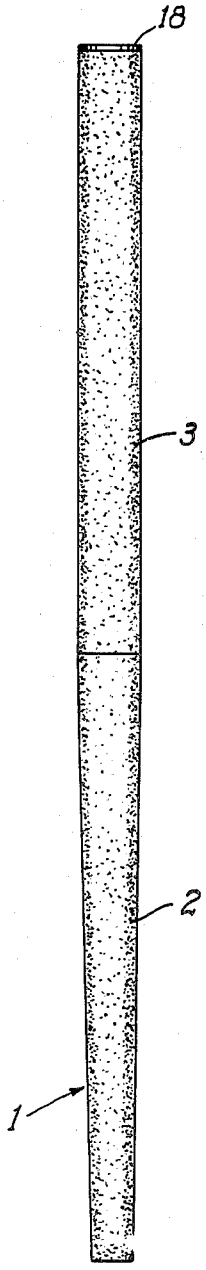


Fig. 1

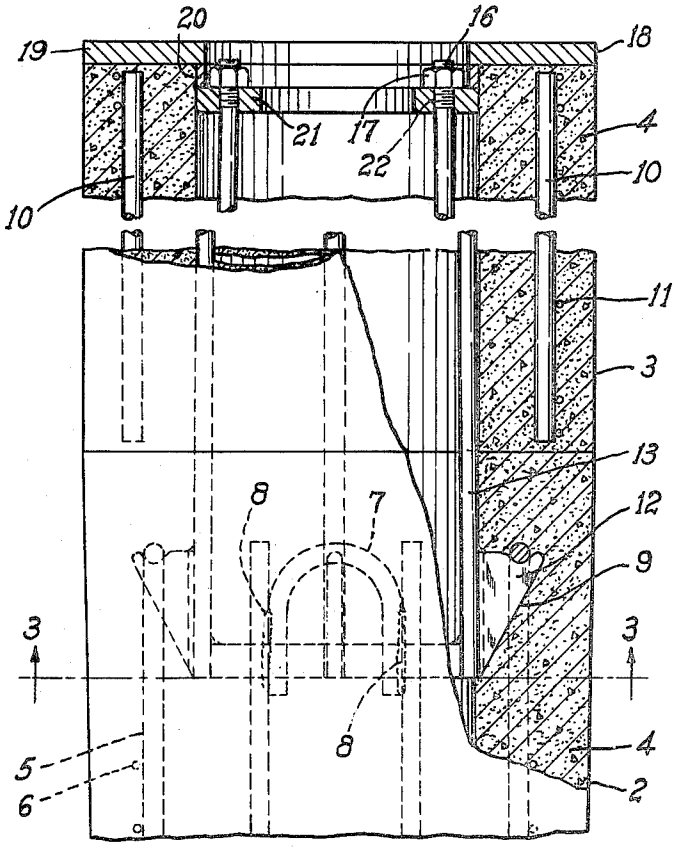


Fig. 2

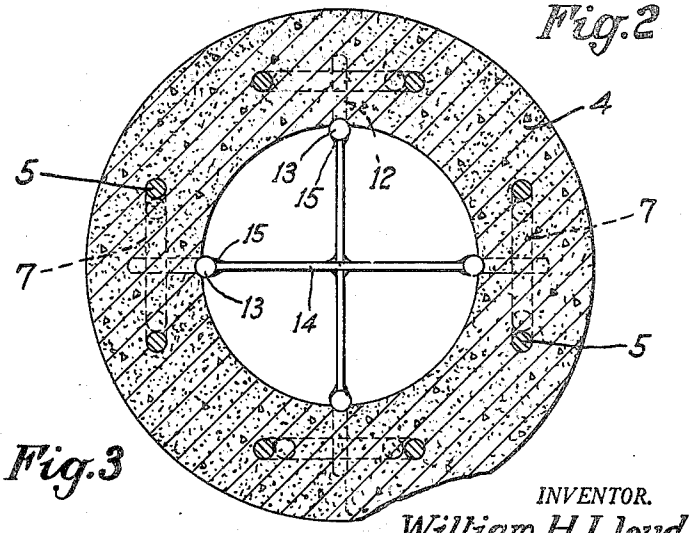


Fig. 3

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CONCRETE PILE JOINT

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The invention relates to concrete piles and more particularly to cast concrete piles and to a joint construction between adjacent sections of a cast concrete pile.

Cast reinforced concrete piles are used in large numbers in the construction of bridges, buildings and other structures requiring a firm foundation since this type of piling can be driven directly with a hammer and without the use of special equipment such as a driving mandrel required for the driving of metal shells for forming cast-in-place concrete piles.

In driving a pile at any particular locations, the ultimate length of pile required may not be known before the first few test piles are driven. For this reason, cast reinforced concrete piles are frequently made in sections which must be spliced or otherwise secured together at the abutting ends of the sections to form the completed pile either prior to driving the pile or as each section is driven.

Moreover, cast reinforced concrete piles, particularly in the larger diameters, are extremely heavy and if of great length and made in one piece and then transported to the pile driving site, very heavy equipment must be used for transporting and handling the same. Also it is difficult to avoid damage to long, heavy cast concrete piles in transporting the same. For these reasons, cast reinforced concrete piles normally are cast in sections and the sections spliced or otherwise secured together at the driving site either prior to driving or in case of necessity when the driven pile is not long enough, as each section is driven.

In driving a pile, blows of the driving hammer must necessarily be applied to the pile at the upper end thereof and frequently the end portion of a cast concrete pile may chip or spall because of the impact of the hammer blows so as to damage the joint between spliced sections and to interfere with the proper transmission of driving blows from one end of the pile to the other. This difficulty is more of a problem where a joint is made after a lower section has been driven, but the same difficulties can occur even though a splice or joint is made prior to driving because of the necessity of transmitting the driving blows through the joint.

Accordingly, it is a general object of the present invention to provide a new type of joint for securing together sections of cast reinforced concrete piles which are to be driven directly without the use of a mandrel.

Furthermore, it is an object of the present invention to provide a new type of joint for a cast reinforced concrete pile in whcih the driving force is transmitted from end to end of the pile through the joint and the reinforcing means without chipping or cracking, or otherwise spalling the concrete material at the adjacent or abutting ends of the pile sections which are joined together.

Also, it is an object of the present invention to provide a new type of joint for cast reinforced concrete piles which enables pile sections to be joined together after one section has been driven in spite of any chipping, cracking or spalling that may have occurred at the top

end of the driven section prior to joining the next section thereto.

Furthermore, it is an object of the present invention to provide a new joint construction for the sections of cast reinforced concrete piles which is simple to form, inexpensive to fabricate and which is very strong and efficient in use.

Finally, it is an object of the present invention to satisfy the need and solve long existing problems in the art of cast reinforced concrete pile construction, to eliminate prior art difficulties in this field, generally to improve and simplify the driving of cast concrete piles, and to obtain the foregoing advantages and desiderata in a simple, inexpensive and effective manner.

These and other objects and advantages apparent to those skilled in the art from the following description and claims may be obtained, the stated results achieved, and the described difficulties overcome, by the improvements, elements, combinations, subcombinations, arrangements and constructions which comprise the present invention, the nature of which is set forth in the following general statement, a preferred embodiment of which—illustrative of the best mode in which applicant has contemplated applying the principles—is set forth in the following description and shown in the drawing, and which are particularly and distinctly pointed out and set forth in the appended claims forming part hereof.

The nature of the discoveries and improvements in concrete pile joint construction of the present invention may be stated in general terms as preferably including in a joint between abutting ends of cast reinforced concrete pile sections, a first preferably lower tubular cast reinforced concrete pile section, longitudinal metal reinforcing rods in the tubular walls of said first pile section, U-shaped rod members secured to the upper ends of said reinforcing rods adjacent the upper end of said first pile section, there being cavities formed in the inner surface of the tubular wall of said first pile section communicating between the base of the U of said U-shaped rods and the longitudinal passage formed by the tubular wall, a second or upper tubular cast reinforced concrete pile section, ring-like metal cap plate means at the upper end of said second section, a series of tensioning rods extending from end to end through said upper section, the lower ends of said tensioning rods having hook members extending into said cavities and engaging the U-shaped rods of said first section, means maintaining said hook members in engaged position, and adjustable means securing the upper ends of said tensioning rods to said cap plate at the upper end of said second section whereby the tensioning rods may be tensioned to securely clamp the second section to and in axial alignment with said first section.

By way of example, the improved concrete pile joint construction of the present invention is shown in the accompanying drawing forming part hereof wherein:

Figure 1 is a diagrammatic view of a sectional pile incorporating the improved joint construction of the present invention;

Fig. 2 is an enlarged fragmentary view partly in section through the pile joint illustrated in Fig. 1; and

Fig. 3 is a section taken on the line 3—3, Fig. 2.

Similar numerals refer to similar parts throughout the various figures of the drawing.

A cast reinforced sectional concrete pile is generally indicated at 1 in Fig. 1 and includes a lower section 2 and an upper section 3. The lower section 2 is illustrated as being tapered and may have any desired usual or standard length such as twenty feet for a pile section 16″ in diameter at its upper end and 10″ in diameter at its lower end. The lower end of the pile section 2 may be formed as shown.

The upper pile section 3 which forms an extension for the lower tapered section 2 may have any desired length consistent with the pile requirements and for instance may be a fifteen foot cylindrical extension.

The sections 2 and 3 may have other lengths or diameters than those described, and for instance the section 3 may have a length of five, ten or twenty feet. Although the improved construction of the present invention is primarily adapted for joining two sections of a two section reinforced cast concrete pile together, it will be apparent from the following description that the improved joint construction can be incorporated in a pile made of more than two sections each of any desired length.

Each of the pile sections 2 and 3 may be fabricated to tubular or tapered tubular shape with a tubular wall 4 of reinforced concrete of desired thickness. These sections may be poured in forms but preferably are fabricated by spinning. The lower section 2 is provided with usual longitudinal steel reinforcing rods 5 which may be formed as a cage in the usual manner with spiral wire wrapping 6, such assembled rod and wire wrapped reinforcing cage 5—6 being placed in the form before the concrete is poured or in the spinning mold prior to introducing the concrete therein. Furthermore, the resulting cast reinforced pile section 2 may have prestressed reinforcing members therein in accordance with usual practice if desired.

In accordance with the present invention, adjacent reinforcing rods 5 are joined together at their upper ends adjacent the upper end of lower pile section 2 by bent U-shaped rod members 7 which are welded at 8 to the reinforcing rods 5. Any number of bent U-shaped rod members 7 may be provided, four being shown secured to eight longitudinal reinforcing rods 5. In casting the pile section 2, a cavity 9 is formed communicating between the inside of the tubular wall 4 and the underside of the U of each U-shaped member 7; such cavities being provided by positioning core-like members in the pile form or mold.

The upper section 3 also is provided with usual longitudinal steel reinforcing rods 10 which likewise may be formed as a cage in the usual manner with spiral wire wrapping 11, and such assembled rod and wire wrapped rod reinforcing cages 10—11 may be placed in the forms before the concrete is poured or in the spinning mold prior to introducing the concrete therein. Also, the resulting cast reinforced pile section 3 may have prestressed reinforcing members therein in accordance with usual practice if desired.

In accordance with the present invention, in assembling the sections 2 and 3 together, hook members 12 at the lower ends of tensioning rods 13 are inserted in the cavities 9 and engaged under the U of the U-shaped members 7 as shown in Fig. 2. In order to prevent the hook members 12 from dropping out of the cavities 9 during assembly, and to maintain them in proper position after they are engaged with the U members 7, a steel bar lattice 14 (Fig. 3) is welded at 15 to the lower ends of rods 13 thus permanently assembling the tensioning rods to the lower pile section 2. This steel bar lattice member 14 also prevents the tensioning rods from bending and the hook members from slipping out of engagement with the U-shaped members when tension is applied to the rods 13.

After the tensioning rods 13 have been positioned and secured in engagement with the U-shaped members 7, the upper section 3 is slipped or telescoped over the projecting rods 13 and the upper ends 16 of the rods 13 are tied by nuts 17 with a cap member 18 engaging the upper end of pile section 3 to tension the rods 13 and securely lock the two pile sections 2 and 3 together.

The cap member 18 preferably is formed by a large end plate 19 welded to a sleeve ring 20 engaged within the upper end of tubular pile section 3, which in turn

is welded to a flange-like plate 21 provided with apertures 22 for receiving the ends of tensioning rods 13.

If the pile 1 must be extended for a greater length, additional sections of the desired length fabricated in a manner similar to the construction of upper section 3 may be used, end to end, and the tensioning rods 13 lengthened accordingly to tie the additional sections together as a unit with the lower section 2.

In accordance with the present invention, when the pile sections are fabricated in the manner described, such sections may be transported to or assembled at the driving site in lengths or weights which are convenient to handle. The joint may then be formed between the pile sections in the manner described, prior to driving the pile; but in case of necessity, the lower section 2 may be driven and the upper section 3 joined thereto in the manner described, after which the pile may be driven further into the ground.

After the driving of the pile has been completed the longitudinal opening within the tubular walls of the sections may be filled with concrete to ultimately form a "cast-in-place" concrete pile.

Accordingly, the present invention provides a new, strong and efficient joint for securing together sections of cast reinforced concrete piles which may be driven directly into the ground without the use of a mandrel; provides a cast concrete pile joint which enables the sections to be joined at the driving site usually prior to driving, but in case of necessity after a lower section has already been driven; and provides a construction satisfying a long standing need in the art which eliminates prior art difficulties and improves and simplifies the driving of cast concrete piles in an inexpensive, effective and efficient manner obtaining the advantages described.

In the foregoing description, certain terms have been used for brevity, clearness and understanding; but no unnecessary limitations are to be implied therefrom beyond the requirements of the prior art, because such terms are used for descriptive purposes herein and not for the purpose of limitation and are intended to be broadly construed.

Moreover, the description of the improvements is by way of example and the scope of the present invention is not limited to the exact details illustrated nor to the specific elements shown.

Having now described the features, discoveries and principles of the invention, the construction and use of a preferred embodiment thereof, and the advantageous new and useful results obtained thereby; the new and useful elements, combinations, subscombinations, arrangements and constructions, and mechanical equivalents obvious to those skilled in the art, are set forth in the appended claims.

I claim:

1. In a sectional cast reinforced concrete pile, end-abutted tubular pile section joint construction including, a first tubular concrete pile section, longitudinal reinforcing rods imbedded in the concrete in said first section, hook engaging members imbedded in said first section concrete and fixed to said rods adjacent a joint-end of said first section, said first section having an opening therethrough and being provided with recess means communicating between said opening and said hook-engaging members, a second tubular pile section in axial alignment with and having one end abutting the joint-end of said first section, an end cap engaging the other end of said second section, tensioning rods engaging said end cap and extending through said second section and into the first section opening, and hook members carried by the tensioning rods extending into said recesses and engaging said hook-engaging members.

2. The construction defined in claim 1 in which the hook engaging members comprise U-shaped rods welded to the upper ends of adjacent reinforcing rods, and in

which the hook members at the lower ends of the tensioning rods engage said U-shaped members.

3. The construction defined in claim 1 in which the hook engaging members comprise U-shaped members fixed to the upper ends of the reinforcing rods, in which the recess means are formed in the upper end of the tubular wall of the first pile section and communicate with the U of said U-shaped members, and in which the hook members are secured to one end of the tensioning rods and are engaged through said recess means with said U-shaped members.

4. The construction defined in claim 1 in which the end cap is provided wih a flange-like rod engaging portion, and in which said flange-engaging portion is telescoped within the upper tubular end of the second pile section.

5. In a joint between abutting ends of a sectional cast concrete pile, a lower tubular cast pile section, longitudinal metal reinforcing rods in the tubular walls of said lower section, U-shaped rod members secured to the upper ends of said reinforcing rods adjacent the upper

end of said lower pile section, there being inwardly opening cavities formed in the inner surface of the upper end of the tubular wall of said lower pile section communicating between the base of the U of said U-shaped rods and the longitudinal passage formed by the tubular wall of the lower section, an upper tubular reinforced concrete pile section, an end cap at the upper end of said upper section, a series of tensioning rods extending from end to end through said upper section, there being hook members formed on the lower ends of said tensioning rods extending into said cavities and engaging the U-shaped rods, means maintaining said hook members in engaged position, and adjustable means securing the upper ends of said tensioning rods to said end cap.

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