Jan. 4, 1955 W. H. LLOYD 2,698,520

CONCRETE PILE JOINT

Filed Aug. 4, 1952

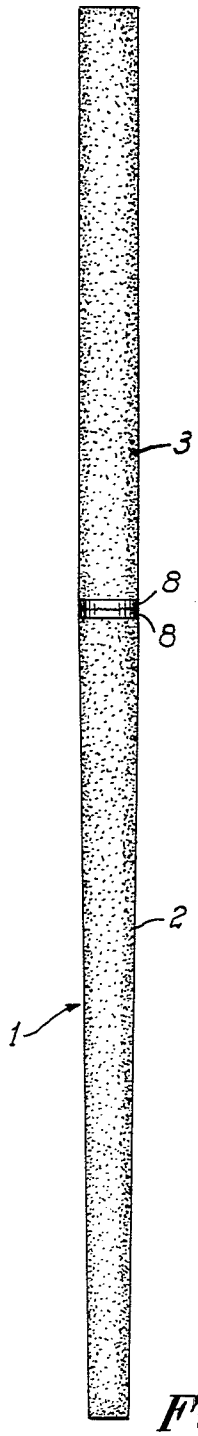

Fig. 1

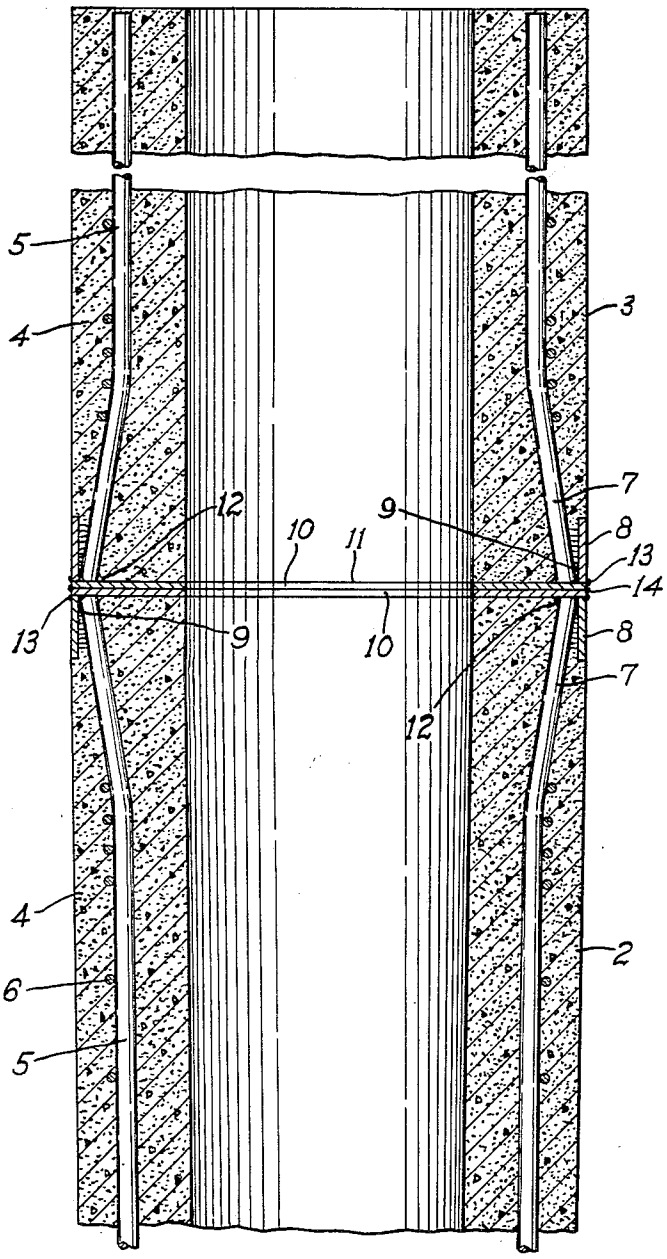

Fig. 2

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United States Patent Office 2,698,520
Patented Jan. 4, 1955

2,698,520

CONCRETE PILE JOINT

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Application August 4, 1952, Serial No. 302,488

3 Claims. (Cl. 61—56)

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 location, 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 them or as each section is driven.

Moreover, cast reinforced concrete piles, particularly in the larger diameters, are extemely 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 which 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 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 annular band-like metal ring secured to and surrounding the longitudinal pile reinforcing members or rods at an end portion of a first pile section, the outer surface of said ring conforming in contour to the contour of the outer surface of the said end portion of said first pile section, a second annular band-like metal ring secured to and surrounding the longitudinal pile reinforcing members or rods at an end portion of a second pile section abutting said first pile section, the outer surfaces of said second ring conforming in contour to the contour of the outer surfaces of the said end portion of said second pile section, a first lateral metal ring end plate at the end of said first pile section having its outer peripheral edge joined annularly to the outer end of said first annular ring, a second lateral metal ring end plate at the end of said second pile section having its outer peripheral edge joined annularly to the outer end of said second annular ring, said first and second plates being abutted together flatwise with the pile sections in axial alignment, and the outer annular edges of said abutted plates being welded together to form a joint between said pile sections.

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; and

Fig. 2 is an enlarged fragmentary sectional view through the pile joint illustrated in Fig. 1.

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 inches in diameter at its upper end and 10 inches 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.

Although the pile **1** has been described as comprising two sections, it is to be understood that the pile may comprise any number of sections depending upon the requirements of a particular foundation; and the sections may have other lengths or diameters than those described. For instance, the section **3** might have a length of five, ten or twenty feet and additional sections may be joined at the upper end of section **3**.

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. Each section is provided with the usual longitudinal steel reinforcing rods **5** formed as a cage in the usual manner with spiral wire wrapping **6**, such as-

sembled rod and wire wrapped reinforcing cages 5—6 being placed in the forms before the concrete is poured or in the spinning mold prior to introducing the concrete therein. Furthermore, the resulting reinforced pile section may have prestressed reinforcing members therein in accordance with usual practice.

In accordance with the present invention, the longitudinal reinforcing rods 5 are bent outward at 7 at their end portions to direct the ends of the rods 5 toward the outer annular corner of the end of the section which is to be abutted against an adjacent end of another section to be joined thereto.

An annular band-like metal ring 8 is secured by welding at 9 to the outer bent ends 7 of rods 5 at the joint forming end of each pile section 2 and 3, as shown. The outer surface of the ring 8 conforms in contour to the outer surface of the pile section to which it is secured. A plate-like disc or lateral ring end plate 10 is provided at the joint abutting end of each pile section 2 or 3, as shown, the plate 10 preferably having a central aperture 11 therein conforming in contour to the longitudinally extending hole through such pile section. The plate 10 is welded at 12 to the bent ends 7 of the longitudinal reinforcing rods 5 and is welded annularly at 13 to the outer annular end of the adjacent metal ring 8.

The rings 8 and end plates 10 are preferably formed of steel and are assembled with the reinforcing rod cages when the latter are placed in the forms or spinning molds so that after the concrete has set, the plate and ring assembly forms an integral part of the resulting pile section with the plate 12 and ring 8 forming an annular angular covering and protecting device for the concrete at the end portion of the pile section.

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 a driving site in lengths or weights which are convenient to handle and a joint may be formed between the pile sections such as sections 2 and 3 by merely abutting the ends of said sections together, as illustrated in Fig. 2 and holding the same in abutted relation while the annular peripheral edges of the abutted plates 10 are welded together as indicated at 14.

By fabricating a sectional cast reinforced concrete pile in the manner described, the joint illustrated may be formed either prior to driving the joined sections or after one of the sections has been driven, since the improved plate and ring construction at the end of the driven pile section which is to be joined to another section, protects the concrete end of such section against spalling or cracking from the impact of the driving blows imparted by the pile driving hammer.

Moreover, the force of blows imparted to an upper pile section joined to a lower pile section with the improved joint construction is carried through the longitudinal reinforcing rods, annular rings and plates directly without injuriously stressing the concrete in the end portions of the sections adjacent the joints.

After the pile is driven, the longitudinal opening within the tubular walls of the sectional pile is filled with concrete so as to ultimately form a "cast-in-place" concrete pile.

Although the plates 10 have been described as being annularly welded to each other to form the joint because it is believed that such welding forms the strongest and most efficient joint possible, it is understood that the present invention contemplates any means of rigidly securing the two plates 10 together at the joint.

Accordingly, the present invention provides a new, strong and efficient joint for permanently 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; provides a cast concrete pile joint construction in which the driving force is carried from end to end of a sectional pile through the reinforcing means in each section and the metal plates and rings at the ends of the section secured to the reinforcing means;

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, subcombinations, 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 joint between abutting ends of a sectional cast concrete pile having longitudinal metal reinforcing rods therein, a first annular band-like metal ring secured to and surrounding the longitudinal pile reinforcing rods at an end portion of a first pile section, the outer surface of said ring conforming to the contour of the outer surface of said end portion of said first pile section, said first ring extending longitudinally from the end of said first pile section, a second annular band-like metal ring secured to and surrounding the longitudinal pile reinforcing rods at an end portion of a second pile section abutting the said first pile section, the outer surface of said second ring conforming to the contour of the outer surface of said end portion of said second pile section, said second ring extending longitudinally from the end of said second pile section, a first lateral metal end plate ring at the end of said first pile section joined to said first annular ring and the reinforcing rods secured thereto, a second lateral metal end plate ring at the end of said second pile section joined to said second annular ring and the reinforcing rods secured thereto, said first and second pile sections being in axial alignment with said end plates in abutting relation, and said end plates being welded together annularly at their outer edges.

2. In sectional cast reinforced concrete pile construction, a plurality of end-abutted cast concrete pile sections each having longitudinal reinforcing rods therein, a joint between end-abutted pile sections including a cylindrical metal ring adjacent each section end to be joined to another section end, a lateral metal end plate at each section end to be joined integrally secured to said metal ring, each said ring and plate being integrally secured to the longitudinal reinforcing rods in each section, the plates of end-abutted pile sections being abutted to form a joint therebetween, and means integrally securing said plates together.

3. The construction defined in claim 2 in which each pile section includes cast tubular concrete walls having metal reinforcing rods extending longitudinally of the tubular walls, in which said rods are bent outwardly toward the outer annular corner of the joint forming pile section end, and in which the lateral plates are washer-like in shape and are welded to the cylindrical rings, the bent reinforcing rod ends, and to each other to integrally secure the pile sections together.

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