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CONCRETE PILE JOINT

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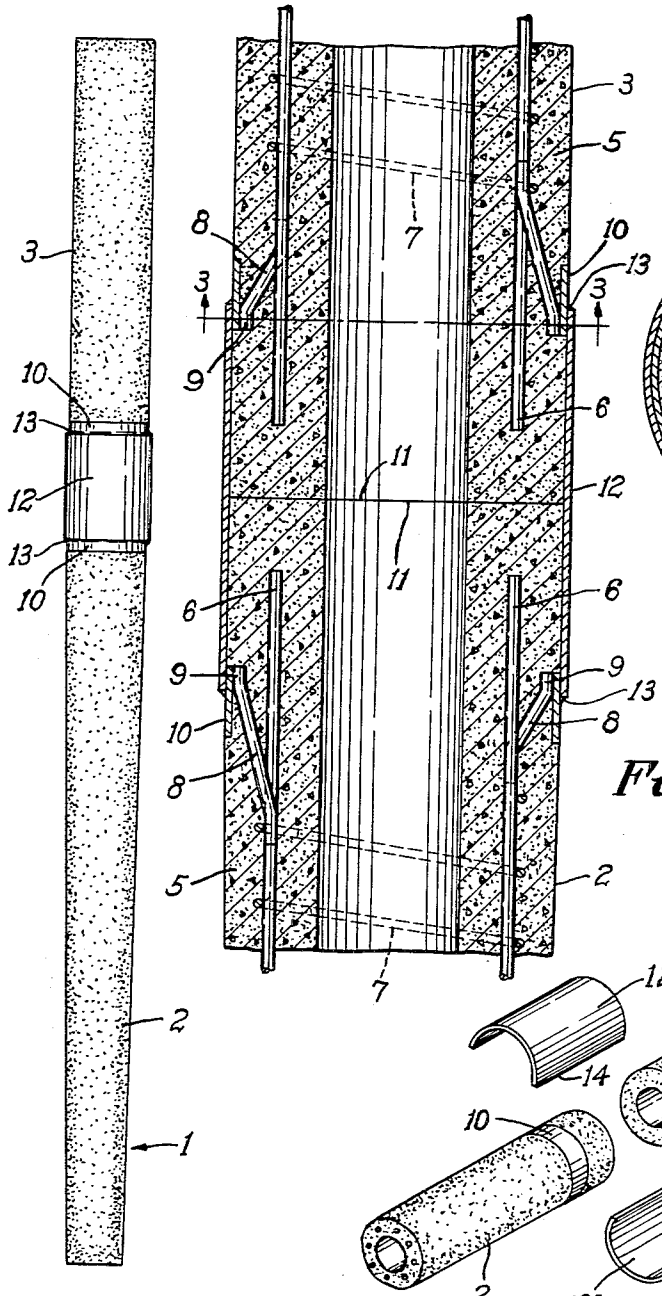


Fig. 1

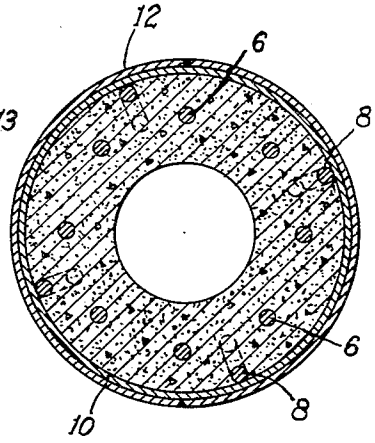


Fig. 3

Fig. 2

Fig. 4

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The invention relates to concrete piles and more particularly to a cast concrete pile 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 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 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, sub-combinations, 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 to the outer surface of the said end portion of said first pile section, said first ring being spaced from the end 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 surface of said second ring conforming to the outer surface of the said end portion of said second pile section, said second ring being spaced from the end of said second pile section, a tubular metal shell telescoped over the abutting ends of the adjacent first and second pile sections, one end portion of said shell overlapping and being annularly secured or welded to the first ring, and the other end portion of said shell overlapping and being annularly secured or welded to the second ring.

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 somewhat diagrammatic side elevation of a pile composed of two sections joined together by the improved joint construction;

Fig. 2 is an enlarged fragmentary longitudinal section through the improved joint of the present invention;

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

Fig. 4 is an exploded fragmentary perspective view of the various elements of the improved joint.

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

A typical sectional cast reinforced concrete pile is generally indicated at 1 in Fig. 1, including a lower section 2 and an upper section 3. The lower section 2 may be cyclindrical or tapered, depending upon driving conditions or the design of the foundation or soil conditions or other considerations. The upper section 3 normally is cylindrical.

Although the pile 1 is illustrated as being composed of two sections, it is understood that depending upon the required pile length and diameter, the pile may have two, three or more sections. Furthermore, for the purpose of description, it may be said that the lower section 2 may be of somewhat standard size or length, such as twenty feet in length, and the upper section 3 may have the same or different length, depending upon the size requirements of the pile. However, any of the sections 2 or 3, or other sections which may be joined to such sections, may have any desired length consistent with ease of handling, transporting and driving.

The pile sections 2 and 3 are each formed of reinforced concrete and may be fabricated in any usual way as by pouring concrete into forms or molds, or by spinning the section in a rotary mold to provide a hollow tubular construction, as illustrated. The tubular walls 5 are provided with longitudinal metal preferably steel reinforcing rods 6 which may or may not be spaced or positioned during spinning or molding by a surrounding helical wire cage 7 as is usual in the manufacture of hollow reinforced

concrete piles. Furthermore, the resulting pile sections 2 or 3, after fabrication, may include what is known in the art as prestressed reinforcing rods.

In accordance with the present invention, auxiliary reinforcing rods 8 are provided, four being illustrated, and the ends of the rods 8 are bent outward as indicated at 9 and welded to an annular band-like metal preferably steel ring 10. The metal ring 10 is formed with an outer diameter or surface conforming to the shape of the outer surface of the pile section of which it forms a part and, as shown, the ring 10 is spaced from the end 11 of its pile section. The end of each pile section that is to be joined to an abutting pile section of the completed pile 1 is provided with the auxiliary reinforcing rod and band construction described.

When the joint between adjacent pile sections is to be completed, a sleeve 12 is telescoped over the abutting ends of adjacent pile sections, and the sections are held securely in such position while the annular ends 13 of the sleeve 12 are welded respectively to the bands 10 adjacent the ends of the pile sections.

Although the sleeve 12 may be a continuous cylindrical sleeve telescoped over the ends of the abutted pile sections, for convenience in forming the joint, the sleeve 12 may be formed of half shells 12*a* and 12*b*, as illustrated in Fig. 4, which are also welded together along their longitudinal edges 14 in completing the joint.

Thus, when the pile joint is completed in the manner described, the sleeve member 12 is subjected to the impact stress of the driving blows while the pile is being driven, so as to relieve from impact the concrete end portions 11 which are abutted.

Furthermore, the force of the driving blows applied by the hammer to the upper end of the pile 1 is transmitted from section to section through the auxiliary reinforcing rods 8, the rings 10 and the sleeve 12 so that any spalling which may have occurred or may occur in the concrete at the ends of the pile sections will not affect proper driving conditions.

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

Although the shell 12 has been described as being annularly welded at each end to the metal rings 10 because it is believed that such a joint between the sleeve and rings is strongest and most efficient, it is understood that the present invention contemplates any means of rigidly securing the sleeve to the metal rings 10, each of which is a permanent, integrally assembled portion of a section of a cast reinforced concrete pile.

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 pile 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 pile section and the metal sleeve secured to the reinforcing means at the joint between the abutted section; and provides a construction satisfying a long-standing need in the art which eliminates prior art difficulties and improves and simplifies the driving of sectional cast concrete piles in an inexpensive, effective and efficient manner obtaining the advantages and desiderata 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, sub-combinations, 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 certain 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 being spaced from the end of said first pile section, a second annular band-like metal ring secured to and surrounding certain longitudinal pile reinforcing rods at an end portion of a second pile section abutting 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 being spaced from the end of said second pile section, a tubular metal sleeve encompassing the abutting ends of the first and second pile sections, one end portion of said sleeve overlapping and being annularly welded to the first ring, and the other end portion of said sleeve overlapping and being annularly welded to the second ring.

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 metal ring spaced from each section end to be joined to another section end, each said ring being integrally secured to the longitudinal reinforcing rods in each section, a metal sleeve telescoped over the abutted pile section ends and overlapping a portion of each ring nearest the joint between abutted ends, and means securing the ends of said sleeve to the outer annular surfaces of the rings.

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, and in which certain of said rods are bent outwardly at a location spaced from an abutted joint forming pile section end, and in which said outwardly bent rods are welded to the metal ring.

4. The construction defined in claim 2, in which the sleeve comprises half sections provided with longitudinal edges welded together, and in which the ends of said sleeve are welded annularly to the rings integrally secured to the end-abutted pile sections over which the sleeve is telescoped.

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