Feb. 16, 1960 E. A. SMITH 2,924,949

PLASTIC PILE SHELLS

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Fig. 1.

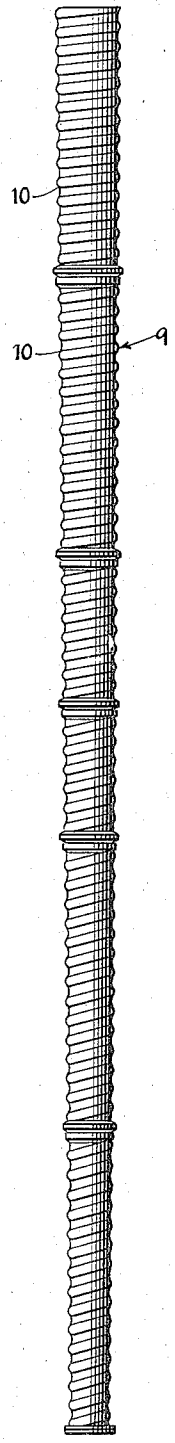

Fig. 2.

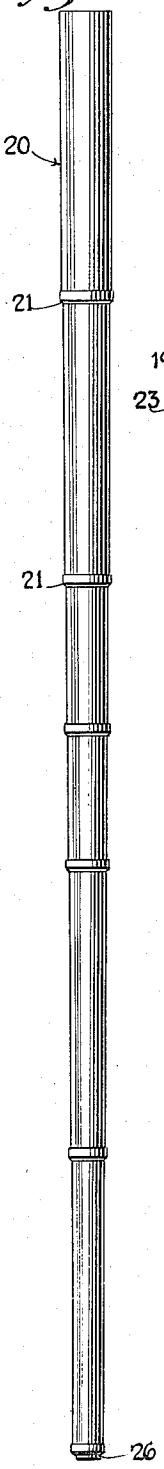

Fig. 3.

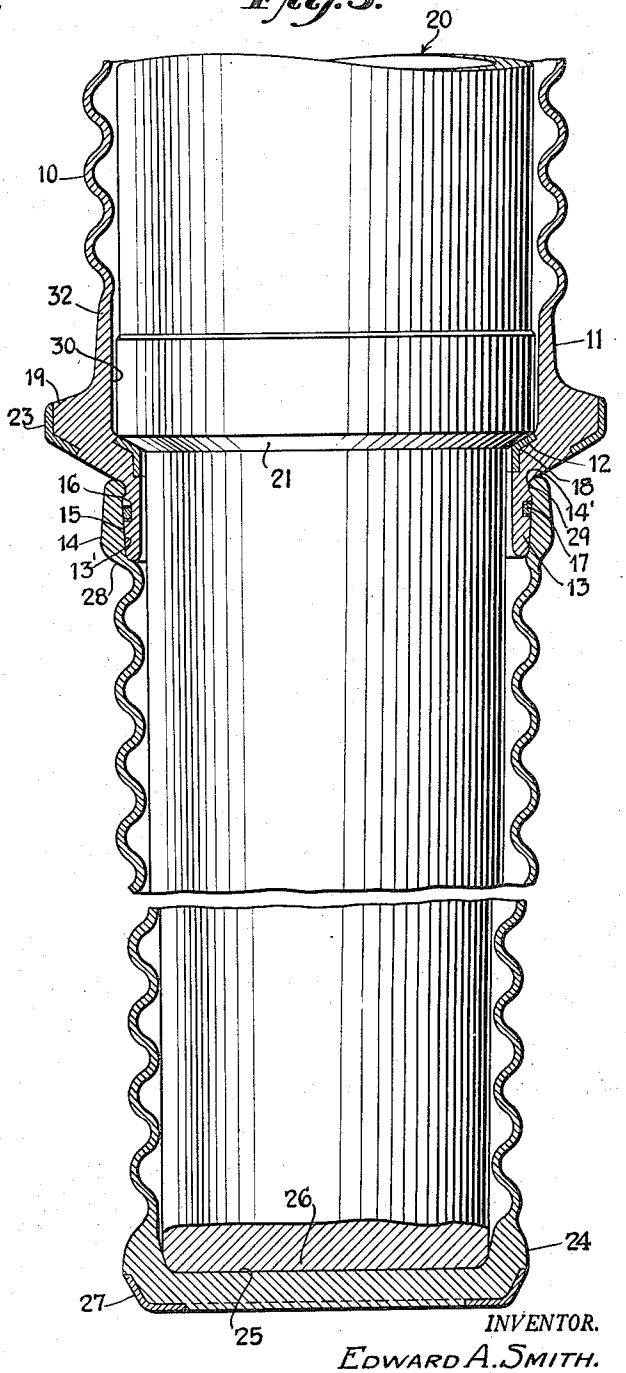

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Fig. 4.

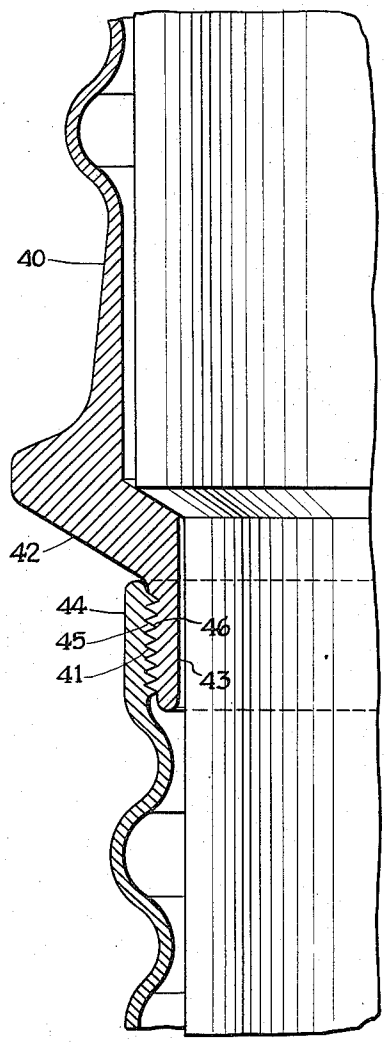
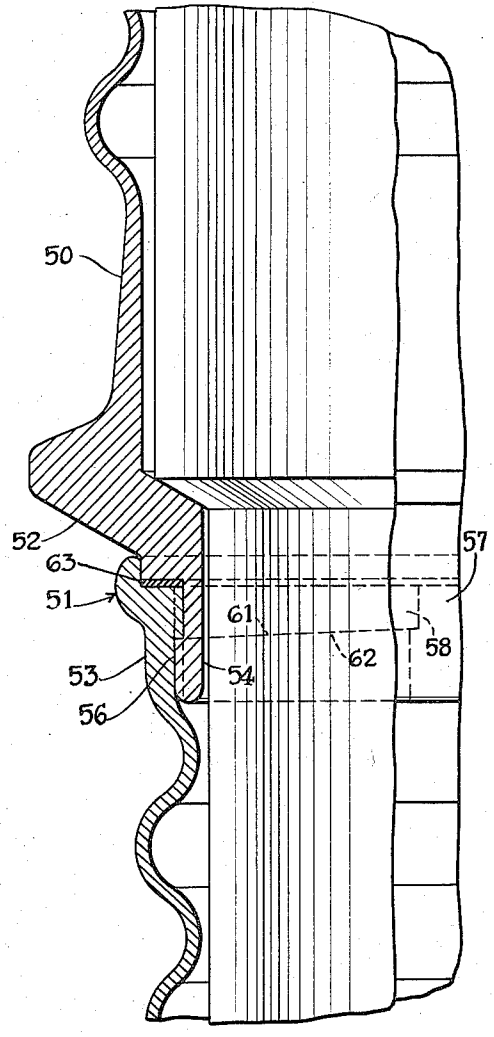


Fig. 5.



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PLASTIC PILE SHELLS

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Application June 3, 1954, Serial No. 434,141

1 Claim. (Cl. 61—78)

This invention relates to tubular pile shells made from plastic material for use in conjunction with the installation of piles and the like.

It is general practice to drive pile shells into the ground by delivering impact hammer blows to a core which is positioned within the shell and contacts the interior of the same at suitable impact receiving points. Such shells are, according to a common practice, made up of a plurality of sections of progressively increasing diameter with each section being provided with a step-ring at one end thereof so as to facilitate joining of adjacent sections having different diameters. These step-rings are moreover provided with circumferentially extending internal surfaces which are designed for receiving the driving hammer blows via the core. At the start of such a driving operation the shell sections as joined together are positioned around the core with the core extending into the lowermost section of the shell and then as the core is driven into the earth by the hammer, the same in turn drives the pile shell.

In the past pile shells have been formed of corrugated metal, and adjacent sections thereof have been joined together by providing an upstanding corrugated collar welded or otherwise secured to the step-ring of one section, which collar is adapted to be threaded into the adjacent corrugated shell section. However, since the dimensions of these shells are of relatively large magnitude the problem of providing accurate tolerances, while maintaining satisfactory economy of manufacture, is very difficult from a practical standpoint and therefore joints thus formed are ordinarily not watertight. Watertightness of such joints is most desirable since any seepage oftentimes causes harmful deterioration of the concrete pile structure itself. Various expedients have been employed in an attempt to overcome this problem. For example the collar of one section has been coated with a sealing compound, such as asphalt, and the mating section then threaded into position. Oftentimes burlap or other similar material has been wrapped around the collar, prior to threading the adjacent shell section thereon, in an effort to obtain a tight fit. None of these methods has proven entirely satisfactory but the alternative of precisely machining the collar and shell so as to insure a sealing fit would be so economically prohibitive that perfect results have necessarily been sacrificed in the interests of cost.

The present invention avoids these difficulties and involves novel constructions permitting shell sections to be joined together in watertight fashion at a relatively low cost. The invention contemplates forming corrugated pile shell sections from a plastic material such as any suitable known type of laminated synthetic resin, such as a phenol formaldehyde material laminated with paper or fabric, or reinforced by glass fiber material.

Since such plastic materials can be molded or "post-formed" by known methods, regardless of size, to very accurate dimensions, the shell sections can be manufactured having a step-ring integrally formed at one end thereof, and moreover said step-ring can itself be provided with suitable joint means designed to coact directly with complementary joint means provided on the adjacent mating shell section in such manner as to insure a watertight fit. Moreover, the present invention makes possible, if desired, the complete elimination of the aforementioned collars which are standard items on metal pile shells.

Further objects, features and advantages of the invention hereof will appear from the detailed description given below in conjunction with accompanying drawings which form a part of this specification and illustrate by way of example, preferred examples of the invention.

In the drawings:

Fig. 1 is an elevational view of a fully assembled plastic pile shell according to the invention.

Fig. 2 is an elevational view of a typical hollow pile core alone, of the type designed to be inserted within the pile shell of Fig. 1 during driving of the latter.

Fig. 3 is a vertical sectional view, showing a pile core inserted within the plastic pile shell of the invention.

Fig. 4 is an enlarged vertical, half-sectional view similar to Fig. 3, but showing an alternative embodiment of the invention, and

Fig. 5 is an enlarged vertical, half-sectional view similar to Fig. 4 but showing a further modified form of the invention.

Referring now in more detail to the drawings and more particularly to the pile shell as shown in Fig. 1, it will be noted that said shell **9** is comprised of a plurality of tubular shell sections **10**, which are joined together so as to form a step-tapered shell having a diameter which diminishes gradually from its uppermost to its lowermost section. As shown in Fig. 3 each of said shell sections **10** is formed in one piece, preferably by molding, of a plastic material and is provided with circumferential corrugations for structural rigidity. Formed integrally at the lower end of each of said sections, with the exception of the lowermost one, is an annular step-ring **11** which is provided with a downwardly extending circumferential skirt portion **13** having an inwardly tapered external surface **13'**. The shell sections are also provided at their upper ends with an upstanding annular lip **14**, formed integrally therewith and having an inwardly tapered internal surface **15** designed to receive in close fitting relationship the downwardly extending skirt of the adjacent shell section. The dimensions and degree of taper of these skirt portions and annular lips are of course precisely controlled during the molding of the shell sections in order that the external taper of the skirt will closely conform to the internal taper of the annular lip of the next succeeding section.

The step-rings and lips are provided respectively with opposed external shoulders **19** and **28** and when it is desired to secure two mating shell sections together, a suitable tool is employed to apply pressure to said shoulders whereby the skirt portion of the upper section is forced downwardly into the tapered lip portion of the lower section thereby accomplishing a simple jam fit which is substantially watertight due to the conformance of the dimensions of the respective parts. An inwardly extending circular bead **14'** may be provided at the upper extremity of the internal surface of lip **14** which snaps

into a circular groove 29 formed in the external surface of the step-ring skirt so as to lock the joint after the sections have been thus forced together.

In order to further insure the watertightness of such a joint a circumferentially extending groove 16 is provided in the outer surface of skirt 13 and is designed to receive an O-ring rubber sealing means 17, the diameter of which is sufficiently large to cause the same to be compressed by tapered surface 15 of the lip portion of the lower section when the mating sections are joined. If desired, prior to such joining the lip surface 15 and the outer surface of complementary skirt portion 13 may be coated with a quick setting plastic cement, so that once the sections are telescoped together a permanent, completely watertight seal is effected.

Each step ring is provided with an internal circumferential shoulder 12 which is designed to receive the impact blows from core member 20, which latter as shown is provided with a plurality of circumferentially extending flanges or shoulders 21, dimensioned so as to contact the internal shoulders of the step-rings. A reinforcing steel ring 18 of angular cross section may be molded in position at each step-ring shoulder 12 so as to give added strength to withstand the stress during the pounding of the core against the pile shell.

As mentioned above during the pile driving action, hammer blows are directed to the upper end of the core member and the impacts therefrom are transmitted via the circumferentially extending shoulders 21 of the core to the internal shoulders 12 of the step-rings of the shell. Since during this driving action the shell itself is forced into the earth, the external shoulders 19 may suffer abrasion from contact with the earth or rocks and are therefore provided with similar steel reinforcing rings 23 to help withstand such abrasion. It should be noted that the upper internal surface 30 of the step-rings is molded so as to be closely spaced from core 20. Thus if the rings should tend to be canted over due to the reaction of the ground on shoulders 19, the internal surface of the same will come in contact with the core thereby preventing such canting. As shown the upper portions 32 of the step-rings are molded so as to be slightly tapered as they lead into the relatively thin portion of the shell sections thereby eliminating any concentration of stress at one point.

As mentioned above the lower end of the lowermost shell section is not provided with a step-ring but rather is formed with an integral boot portion 24 which closes off the bottom of the shell and is provided with an inner impact receiving surface or area 25, designed directly to receive driving blows from the lower or impact end 26 of core 20. As shown this boot portion 24 may be molded integrally with the lower pile shell section and be provided with a steel reinforcing ring 27 designed to aid the shell member in withstanding stress as the latter is forced into the earth.

Referring now to the embodiment of the invention shown in Fig. 4, it will be seen that mating plastic pile shell sections 40, of design generally similar to the sections 10 discussed above in connection with Figs. 1–3, are directly joined together by a screw threaded connection 41. These shell sections 40 are molded in one piece from a plastic material so as to be provided at one end with a step-ring 42 having a downwardly extending skirt portion 43 and at the other end with an upstanding annular lip portion 44. Lip portions 44 are provided with internal threads 45 and skirt portions 43 are provided with external threads 46. Since the plastic material can be molded to precise tolerances, these threads, even though formed on members of relatively large diameter, may be accurately conformed so as to matingly engage one another and thereby form a watertight fit. To further insure the watertightness of such a joint the threads can be tapered in well known fashion so as to permit a more facile threading action between the two sections.

In the embodiment of the invention shown in Fig. 5

plastic pile shell sections 50 are shown which are generally similar in overall design to those shown in Figs. 1–3, except in that they are provided at their ends with complementary means to form a bayonet lock type joint 51 between mating sections. Each section 50 is molded in one piece and comprises a step-ring portion 52 at one end thereof and an annular lip 53 at the other end. The step-rings 52 have a downwardly extending skirt portion 54 which has formed integrally therewith a plurality of radially protruding and circumferentially extending lugs 56 which are designed to pass vertically through guideways 57 formed on the inner surface of each lip 53 and past a plurality of spaced, radially protruding and circumferentially extending ribs 58 provided on the inner surfaces of the lips 53. When it is desired to join mating shell sections, the upper section is positioned above the lower one so that its lugs 56 are aligned with guideways 57 thereof. Thereupon the upper section is telescoped into the lower one and then rotated relative thereto so that lugs 56 pass under ribs 58 as shown. It should be noted that said lugs and ribs are provided respectively with oppositely inclined helical-like bearing surfaces 61 and 62 respectively which, upon such relative rotation between shell sections, frictionally engage each other to form a tight joint. Once again since the respective dimensions of the complementary plastic shell sections can be controlled to close tolerances during their molding, a watertight join can be accomplished. To further insure such watertightness a flat, annular rubber gasket 63 may be inserted, as shown between the mating shell sections.

It should be further understood in connection with each of the aforesaid embodiments of the invention that, if desired, some suitable organic plastic cement may be positioned on the cooperating, locking portions of adjacent shell sections prior to joining thereof and then after joining by applying heat to the area of the joints, the complementary sections can be heat sealed together so as to form in effect a unitary shell thereby giving added insurance against water seepage. In the alternative by proper selection of a suitable plastic material for the shell sections themselves, after assembly said sections can be heat sealed directly one to the other without the necessity of such a cement.

Although certain particular embodiments of the invention are herein disclosed for purposes of explanation, various further modifications thereof, after study of this specification, will be apparent to those skilled in the art to which the invention pertains. Reference should accordingly be had to the appended claim in determining the scope of the invention.

What is claimed and desired to be secured by Letters Patent, is:

A plastic pile shell comprising a plurality of one piece, tubular plastic shell sections having integral annular step-rings formed at one end thereof and integral annular lips formed at the other end, said sections being disposed in axial alignment with adjacent step-rings and lips secured together, each of said step-rings and lips having an external shoulder providing means for forcing the shell sections together to form connecting joints, said step-rings being formed with a downwardly extending integral skirt portion with a circular groove in the external surface thereof, said annular lips including an upstanding portion into which extends the skirt portion of the next adjacent shell section, said upstanding portions formed with an inwardly extending annular bead of sufficient diameter relative to the outer diameter of the skirt portion that it is adapted to snap into the circular groove when the sections are forced together, one of said portions having an annular recess therein facing the other of said portions, an O-ring in said annular recess, whereby said step-rings and lips cooperate to form watertight joints between said tubular plastic pile sections, said step-rings also being formed with an internal surface for accepting driving forces from a driving core, and a member molded

in position at each of said internal surfaces for reinforcing the same against such driving forces.

References Cited in the file of this patent

UNITED STATES PATENTS

777,351	Raymond	Dec. 31, 1904
1,867,430	Wisner	July 12, 1932
1,936,541	Mechlin	Nov. 21, 1933
2,288,576	Titcomb et al.	June 30, 1942
2,392,085	Ferrel	Jan. 1, 1946
2,639,589	Smith	May 26, 1953
2,704,153	Florman	Mar. 15, 1955
2,706,065	Stone	Apr. 12, 1955
2,718,980	Strom	Sept. 27, 1955
2,720,332	Holt	Oct. 11, 1955
2,735,699	Chadbourne	Feb. 21, 1956