

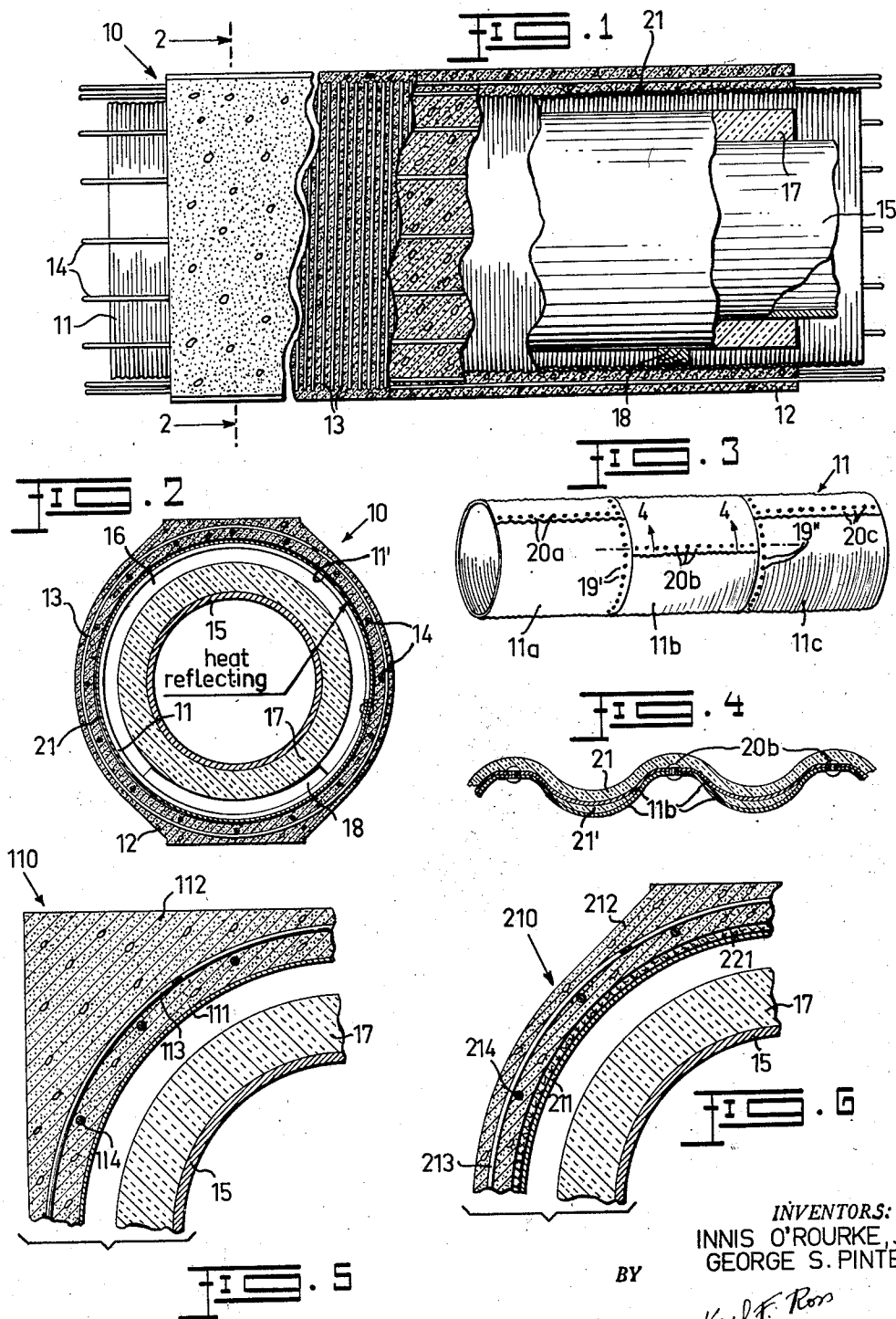
Jan. 21, 1958

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ENCASEMENT FOR STEAM PIPES OR THE LIKE AND
METHOD OF MAKING SAME

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Filed Sept. 9, 1955

2 Sheets-Sheet 1



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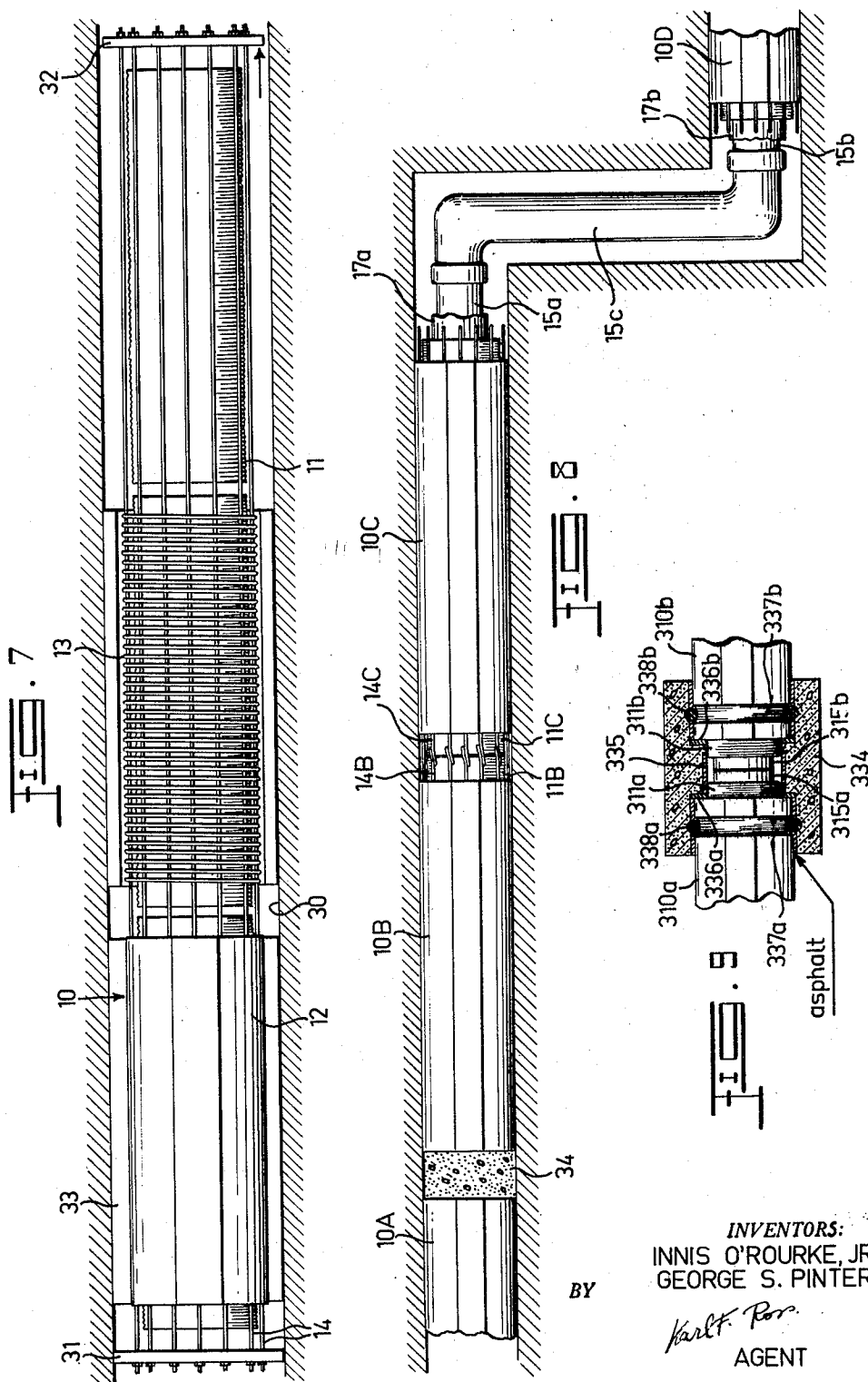
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ENCASEMENT FOR STEAM PIPES OR THE LIKE AND METHOD OF MAKING SAME

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8 Claims. (Cl. 138—66)

Our present invention relates to a protective jacket or encasement for steam pipes and similar elongated objects adapted to radiate heat intermittently or at varying rates.

In the jacketing of such objects it is important to provide an envelope of sufficient mechanical strength, low heat conductivity and a small thermal coefficient of expansion, resistant to deterioration when exposed to the atmosphere and when disposed under ground. The most suitable material for this purpose is concrete; it has, accordingly, been customary heretofore to encase a length of steam pipe in a concrete envelope cast in place. This procedure is time-consuming and therefore expensive, especially in congested areas.

It is also known to erect such encasement of concrete or other masonry by assembling on the building site a plurality of preformed tubular sections. With present-day methods of manufacture, however, these sections can only be produced in relatively short lengths, requiring an excessive number of field connections.

Another drawback of conventional encasements, whether preformed or cast in place, is that the concrete will easily crack under stresses due to varying temperature.

It is an object of the present invention to provide a moisture-proof encasement for steam pipes or the like which can be quickly and easily installed on site in long sections and which is rugged enough to withstand handling and to resist stresses due to active forces as well as thermal stresses.

A more particular object of my invention is to provide a method of so forming a concrete jacket of the above character on a permanent supporting core as to allow for subsequent thermal expansion or contraction of the core and the jacket relative to each other.

Still another object of this invention is to provide a method of mass-producing a number of precast and prestressed units adapted to serve as individual sections of an envelope for an elongated conduit or the like.

A feature of our invention resides in the provision of a precast, prestressed tubular concrete member whose prestressing elements project from either or both ends of the member to serve as means for connecting it to a second, similar member.

Another feature of our invention resides in the provision of a tubular core for the concrete member, this core projecting endwise from the member and being adapted to be joined, either directly or through the intermediary of an expansion joint, to the projecting core portion of an adjacent member and to form a support for a filling of concrete cast in place to interconnect the two members.

The above and other objects, features and advantages of the present invention will become more fully apparent from the following detailed description of certain embodiments, reference being made to the accompanying drawing in which:

Fig. 1 is a side elevational view (parts broken away) of a precast concrete member forming part of an encasement according to the invention;

Fig. 2 is a sectional view taken on the line 2—2 of Fig. 1;

Fig. 3 is a perspective view, drawn to a smaller scale, of a corrugated metal sheet forming the core for the member of Fig. 1;

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Fig. 4 is a greatly enlarged fragmentary sectional view taken on the line 4—4 of Fig. 3;

Figs. 5 and 6 are fragmentary sectional views, similar to part of Fig. 2, of two modified precast members embodying the invention;

Fig. 7 is a top plan view of a casting site used in the manufacture of a series of precast members of the type shown in Fig. 1;

Fig. 8 is a top plan view of a building site, illustrating the jacketing of a conduit by a series of members of the type shown in Figs. 1 and 7, and

Fig. 9 is a fragmentary view (partly in section) of an expansion joint used in place of one of the joints of Fig. 8.

The member 10 shown in Figs. 1 and 2 comprises an inner core 11 of corrugated sheet metal and a surrounding concrete layer 12; sheet 11 projects at both ends beyond layer 12. An untensioned reinforcement 13, shown as a helical steel spring, and a series of prestressed steel tendons 14, lying along generatrices of a cylinder concentric with core 11, are imbedded in layer 12; it will be noted that tendons 14 extend somewhat beyond the ends of core 11. The unit 10 concentrically envelops a steam pipe 15, leaving a cylindrical air space 16 between the sheet 11 and a layer of insulation 17 which sheaths the pipe 15; the proper spacing is maintained by a series of segmental supports 18 (only one shown).

The metal sheet 11 is composed of a plurality of sections 11a, 11b, 11c as shown in Fig. 3. These sections are joined together by circularly disposed rivets 19', 19"; each section is rolled into a cylinder from a flat sheet whose opposite edges are interconnected by longitudinally disposed rivets 20a, 20b, 20c to form a seam. Each rivet passes through apertures slightly larger in diameter than the stem of the rivet whereby some relative motion or "breathing" of the overlapping sheet portions will be possible. It will be noted that the seams formed by the rivets 20a, 20b, 20c are angularly staggered, whereby any relative tangential movement of the sheets may occur along the stepped line 20a—19'—20b—19"—20c; this movement is restrained by the shearing resistance of the layer 12 along lines 19' and 19" when the core 11 is encased in concrete. In the axial direction, on the other hand, such movement is opposed only by the tensile strength of the concrete which might be insufficient in the absence of prestressing as provided by tendons 14.

The sheet 11 is coated externally with an asphalt layer 21 separating the metal from the concrete 12. This bituminous layer, besides serving as a waterproofing agent, has a dual function. On the one hand it prevents any bonding between the metal and the concrete, thereby avoiding the formation of cracks in the shell 12 due to unequal expansion of the two materials. On the other hand it constitutes a yieldable cushion between the core 11 and the layer 12, thus allowing the metal to expand without busting the concrete shell. The latter effect is due not only to a certain mobility of the asphalt layer 21 especially when heated, which tends to equalize radial stresses all over the periphery of core 11, but also to the fact that the seams of the core are not perfectly fluid-tight and form channels through which part of the asphalt will be extruded into the interior of the core, as shown at 21' in Fig. 4, when the pressure becomes excessive. Sheet 11 is shown provided internally with a heat-reflecting lining 11', e. g. of paper-backed aluminum foil.

Although the provision of a permanently imbedded metal core 11 is desirable to facilitate the assembly on site, as will be apparent hereinafter from the description of Fig. 8, it is to be understood that other materials may be used to support the concrete. Thus, we have shown in Fig. 5 a precast member 110 whose concrete layer 112, which apart from its square configuration is

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similar to layer 11, is cast directly on a core 111 of fibrous material. While asbestos has been shown as a specific example of mineral fibers, it will be appreciated that vegetable or synthetic fibres may likewise be used. The reinforcements 113, 114 of Fig. 5 correspond to elements 13 and 14, respectively, of Fig. 1.

The member 210 of Fig. 6 is again similar to member 10, except that its concrete shell 212 is separated from its metallic core 211 by a fibrous cushioning layer 221, e. g. of glass wool. Shell 212 also has imbedded in it the reinforcements and prestressing elements 213, 214.

In Fig. 7 we have shown an elongated trough 30 used for producing several (here three) precast members 10. Resting on suitable supports (not shown) within the trough are the cores 11 of these members, surrounded by the prestressing tendons 14 which are common to all the members and have their terminals secured to a stationary anchor 31 and a movable anchor 32. Anchor 32 is displaced, as indicated by the arrow, until a desired tension has been imparted to the tendons 14; the untensioned reinforcing coils 13 are wound around these tendons, as shown for the middle unit in Fig. 7. Next, with the aid of form work 33, the shells 12 are cast on the cores 11 which have previously been coated with their asphalt layers 21 (Fig. 1). After the concrete has hardened, the tendons 14 are released from their anchors 31, 32 and are cut between adjacent members 10 for easier handling and transportation of the latter.

In Fig. 8 a length of steam pipe 15a, sheathed in insulation 17a, and a length of steam pipe 15b, sheathed in insulation 17b, are interconnected by an elbow 15c enabling a certain longitudinal expansion of the pipes. Pipe 15a is shown enveloped by a series of precast units 10A, 10B, 10C whose cores 11B, 11C are butt-welded and whose prestressing rods 14B, 14C are lap-welded as shown; the joint between adjacent units is then completed by grouting 34 as illustrated for the members 10A and 10B. A similar member 10D is shown enveloping the pipe 15b. It will be understood that the encasement of pipes 15a, 15b, 15c is completed by a jacketing of elbow 15c with the aid of precast and/or poured concrete in the manner generally described above.

In Fig. 9 two lengths of steam pipe 315a, 315b, welded together at their ends, are sheathed in respective encasements comprising cores 311a, 311b within precast and prestressed envelopes 310a, 310b, respectively. The prestressing tendons are cut off flush with the face of envelopes 310a and 310b; being thus invisible in Fig. 9. Cores 311a and 311b, protruding beyond these envelope face are bridged by a tubular shield 335 slipped loosely over their projecting ends. Preformed disk-like fillers 336a, 336b of compressible material, e. g. cork, rubber or asphalt-impregnated fabric, engage the end faces of precast members 310a, 310b; these members are provided, near their said faces, with peripheral annular grooves 337a, 337b receiving rubber gaskets 338a, 338b. A concrete jacket 334 is cast in place without bond around the asphalt-coated extremities of members 310a, 310b and around fillers 336a, 336b as well as shield 335 to form an expansion joint enabling limited relative axial movement between the two envelopes 310a, 311a and 310b, 311b.

It may be mentioned that the formation of precast members of lengths up to about 40 feet by the herein disclosed method has been found practical. The invention is, of course, not limited to the specific embodiments described and illustrated but may be realized in a variety of modifications and adaptations without departing from the spirit and scope of the appended claims.

We claim:

1. The method of jacketing an elongated conduit which comprises the steps of precasting a plurality of tubular concrete shells on respective tubular sheet supports in such manner as to have each support project endwise

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beyond its shell, said supports having an inner diameter greater than the outer diameter of said conduit, axially prestressing each of said concrete shells, positioning said shells in spaced locations with clearance around said conduit, and interconnecting said shells by pouring tubular concrete links therebetween around said conduit.

2. The method of jacketing an elongated conduit which comprises the steps of precasting a plurality of tubular concrete shells on respective tubular sheet supports in such manner as to have each support project endwise beyond its shell, said supports having an inner diameter greater than the outer diameter of said conduit, embedding elongated, axially extending reinforcements in each of said shells, tensioning said reinforcements against the concrete, positioning said supports adjacent one another with clearance around said conduit, interconnecting the projecting ends of adjacent supports, and pouring a connecting layer of concrete around said interconnected projecting ends.

3. The method according to claim 2, comprising the further step of letting the extremities of said reinforcements project beyond the respective shells and joining together said extremities projecting from adjacent shells, said supports being interconnected by a permanent bond.

4. The method according to claim 2, wherein said connecting layer is formed as part of an expansion joint interconnecting adjacent shells without bond, said supports being joined together with freedom of relative axial movement.

5. A method of forming an insulated length of pipe which comprises the steps of providing a plurality of pipe sections, encasing each of said sections with all-around clearance in a slightly shorter, tubular sheet support, pouring a layer of concrete around said support, thereby forming a precast shell for each section, axially prestressing said shell, individually transporting the so encased sections to a building site, positioning said sections end to end at said building site, joining adjacent sections together at their supports, and pouring links of concrete between the shells of adjacent sections.

6. An encasement for steam pipes and the like, comprising a tubular support of solid sheet metal rolled with overlapping edges forming a peripheral cleavage, a concrete shell carried externally on said support, and a heat-softenable mass forming an anti-bonding, cushioning layer between said support and said shell adapted to be extruded through said cleavage upon thermal expansion of said support.

7. An encasement according to claim 6, wherein said layer consists of a viscous mass, said support being provided with seams forming narrow channels for the extrusion of said mass under pressure between said support and said shell.

8. An encasement for steam pipes and the like, comprising a tubular support, a concrete shell carried externally on said support, a tubular array of elongated prestressing means in said shell maintaining the concrete thereof under axial compression, untensioned reinforcement means extending helically around said prestressing means within said shell, and an anti-bonding, cushioning layer between said support and said shell.

References Cited in the file of this patent

UNITED STATES PATENTS

771,594	Wilhelmi	Oct. 4, 1904
977,345	Tidnam	Nov. 29, 1910
994,200	Riker	June 6, 1911
1,004,570	Hirsh	Oct. 3, 1911
1,021,082	Wright et al.	Mar. 26, 1912
1,083,002	Chorls	Dec. 30, 1913
1,771,167	Dolan	July 22, 1930
1,774,599	Hutchinson	Sept. 2, 1930
2,153,741	Cobi	Apr. 11, 1939
2,355,584	Douglas	Aug. 8, 1944
2,747,249	Chiverton	May 29, 1956