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[56]

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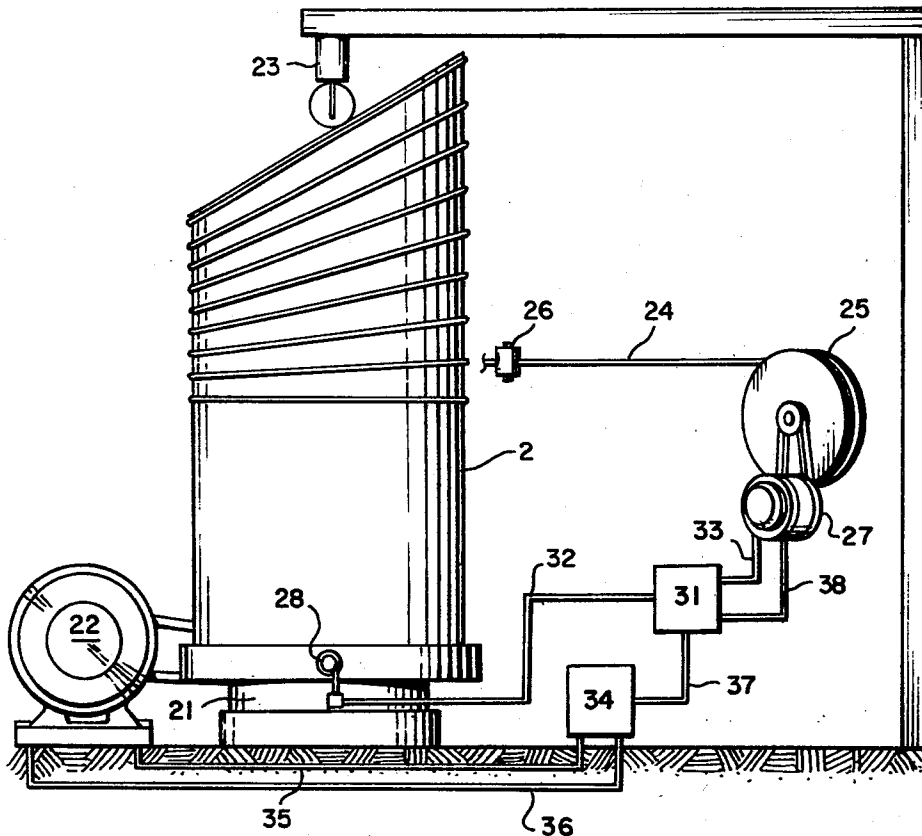
[54] **WRAPPED TUBULAR CONCRETE PIPE**
14 Claims, 7 Drawing Figs.

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138/177, 138/178, 29/452, 242/7.02

[51] Int. Cl. **F16I 9/00**

[50] Field of Search 138/172,
173, 174, 175, 176, 177, 178; 29/155, 155 (C),
452 (Inquired); 242/7.02, 7.22, 7.21 (Inquired);
156/(Inquired)

ABSTRACT: Reinforced concrete and method of making same inclusive of hollow concrete body of tubular shape having beveled end and reinforcing member wrapped on exterior surface of length of concrete body at beveled end in progression of wraps to form continuous helical assembly. Reinforcing assembly under lesser tension along shorter side portion than longer side portion to provide more nearly equal stress in concrete body. Means associated with concrete body onto which reinforcing member is wrapped for holding reinforcing member against circumferential movement to maintain said preselected tension in reinforcing member.



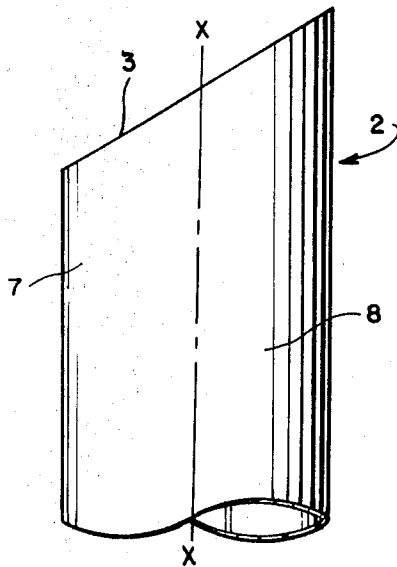


FIG. 1

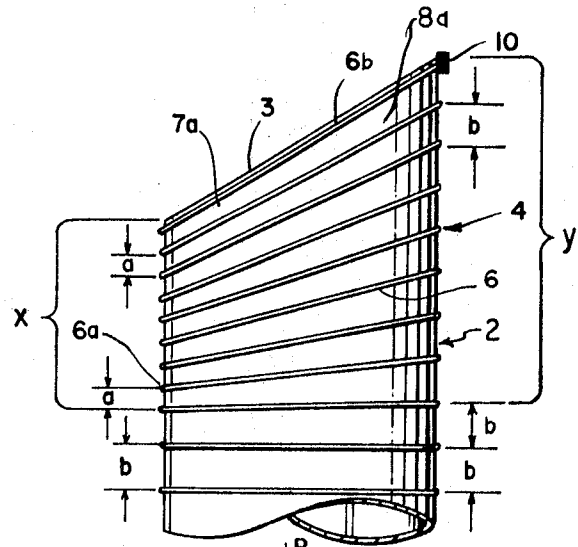


FIG. 2

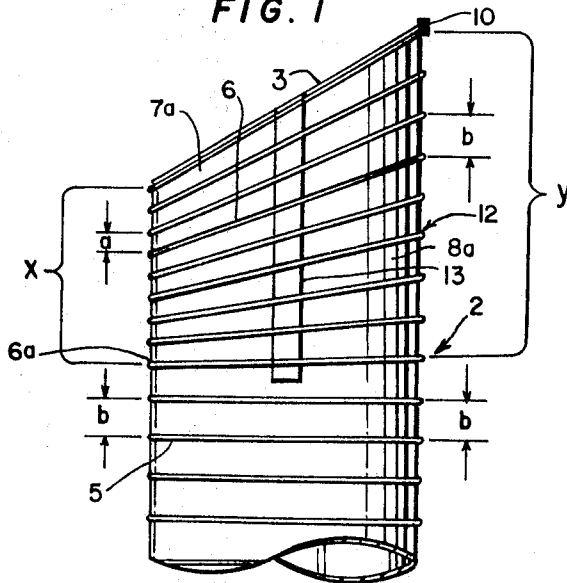


FIG. 4

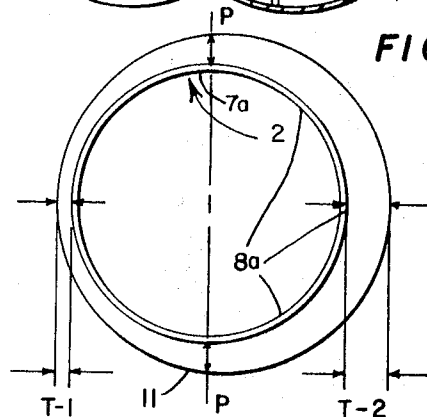


FIG. 3

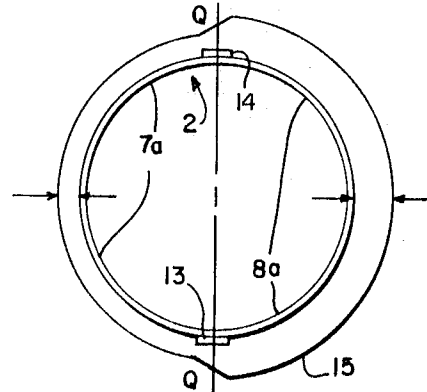


FIG. 5

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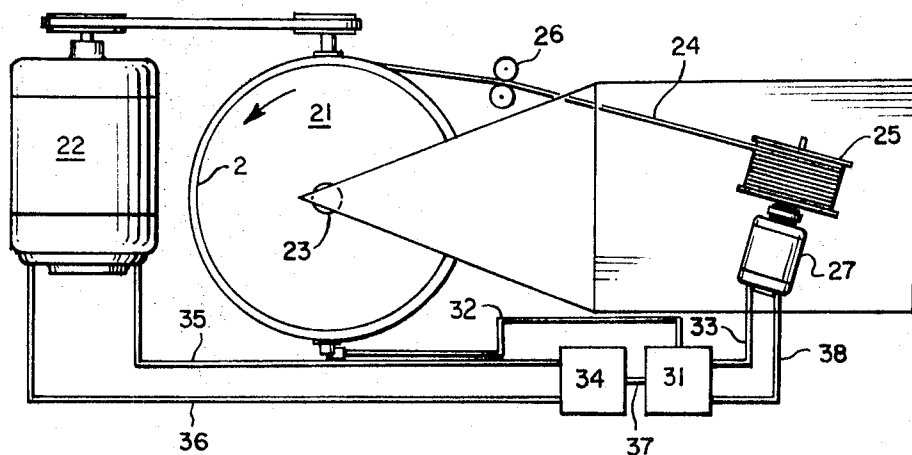


FIG. 6

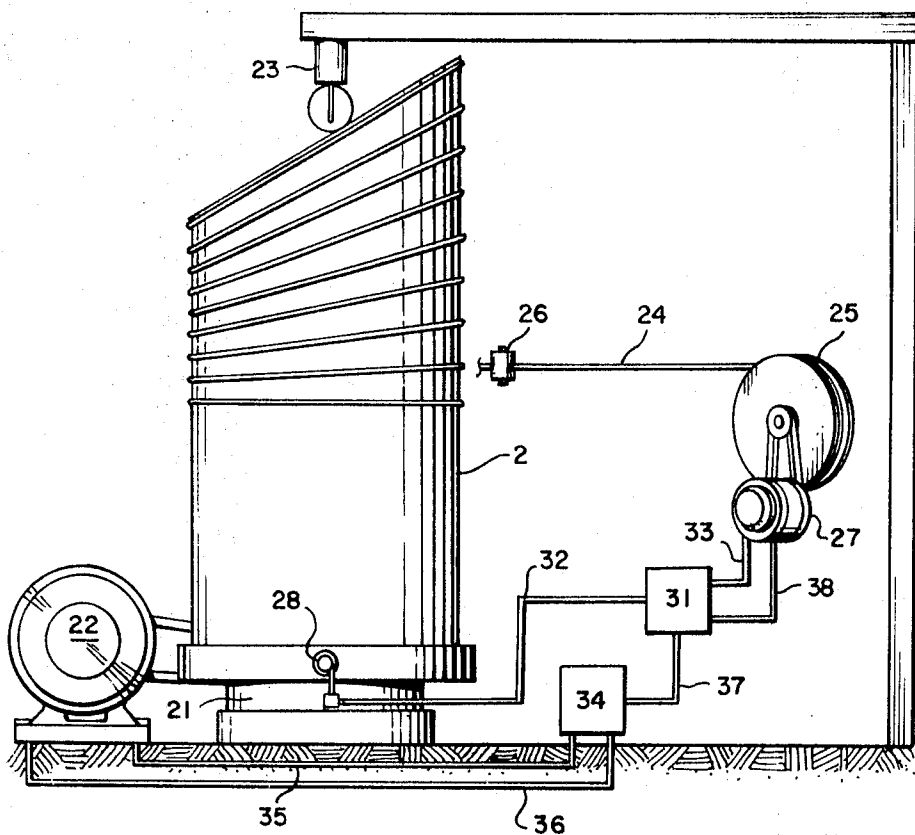


FIG. 7

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WRAPPED TUBULAR CONCRETE PIPE

This invention relates to prestressed concrete and more particularly to improvements in hollow concrete bodies reinforced by a tension member being wrapped lengthwise of the body.

Hollow concrete bodies or tubular sections such as concrete pipe, piling or tanks are frequently reinforced by tension members such as reinforcing rods, wires or strand material being wrapped on the exterior surface of the pipe under tension to achieve compression or stress in the concrete body which will oppose later stresses produced under loading. For many applications, one or both ends of the pipe are not perpendicular to the sidewalls producing sides or halves of unequal width such as what is commonly referred to as a beveled pipe section.

Heretofore in order for these beveled sections to withstand design loads, it has been the practice to place a thick metal section at the bevel or to wrap reinforcing or prestressing material under a constant tension throughout its length and in a manner so that the long side or portion has the same number of wraps as the short side or portion. With such an arrangement there is lesser spacing between applied wraps on the shorter side of the beveled end portion than on the longer side and such a difference in spacing provides greater stress on the shorter side as compared with the long side.

Accordingly it is an object of this invention to provide reinforced hollow concrete with a preselected unequal tension in the reinforcing member wrapped on a selected portion of the hollow concrete.

Another object of this invention is to provide hollow concrete body of the type having side dimensions of unequal length wrapped with a continuous reinforcing assembly so as to exert more nearly equal stresses in said concrete body.

Still a further object of this invention is to provide reinforced hollow concrete having means for holding a continuous wrap of reinforcing member on a surface of concrete body against circumferential movement to maintain established differential tension on the reinforcing member.

It is still another object of this invention to provide a method of making a hollow concrete body having side dimensions of unequal length and reinforced by a tension member wrapping about its periphery to produce more nearly balanced stresses in the body.

Other objects, advantages, and capabilities of the present invention will become apparent as the following description proceeds taken in conjunction with the accompanying drawings in which:

FIG. 1 is a side elevation view of a tubular concrete body section of the beveled type;

FIG. 2 is a side elevation view of a tubular concrete body section as shown in FIG. 1 with the reinforcing or prestressing member wrapped on its exterior with the final wrap being parallel to the beveled end;

FIG. 3 is a schematic diagram showing the approximate tension in the reinforcing member of each wrap for the assembly of FIG. 2 at the beveled end;

FIG. 4 is a side elevation view of a tubular concrete body section shown in FIG. 1 with the reinforcing member wrapped on its exterior surface and passing through or over holding members on the body disposed in a vertical plane which divides the body into a short side and a long side.

FIG. 5 is a schematic diagram showing the relative tension in the reinforcing member of each wrap for the assembly of FIG. 4 at the beveled end;

FIG. 6 is a structural schematic diagram with various components shown in a top plan view of one form of system for carrying out the controlled tensioning of the reinforcing member on the concrete body during wrapping; and

FIG. 7 is a schematic diagram of the system shown in FIG. 6 with various structural components shown in a side elevation view.

Referring now to the drawings, a hollow concrete body 2 of tubular shape is shown in FIGS. 1 through 5 and while it is un-

derstood that such hollow bodies may take various forms and configurations, the present invention is particularly applicable to a typical beveled pipe section as illustrated in FIG. 1. This tubular body or pipe section 2 is beveled in that the surface 3 at one end is in a plane other than perpendicular to the axis of the pipe section. The axis or centerline of the pipe section is designated X-X.

The typical beveled pipe section 2 terminates in an end oppositely of the beveled end which is at right angles to the sides so that the entire tubular body or beveled pipe section will have what will herein be referred to as a short side 7 and a long side 8. For a tubular body of circular section as shown the maximum circumferential extent of sides 7 and 8 is semicircular halves and the shortest lengthwise dimension for the body is at the midpoint of the semicircle of short side 7 and the longest lengthwise dimension for the body is at the midpoint of the semicircle of the long side 8.

Pipe section 2 as shown in FIG. 2 is provided with an elongated reinforcing or tensioning member 4 in the form of a continuous helical assembly comprising a plurality of continuous wraps on the periphery of the pipe section 2. The reinforcing member 4 is placed on the pipe section preferably by a progressive wrapping or winding under tension. The wrapping at the beveled end of the pipe section 2 comprises a plurality of wraps 6 of nonuniform spacing on an end portion extending from wrap 6a and having a final wrap 6b parallel to the beveled end 3. The ends of the reinforcing member may be fixedly secured to the body or pipe section 2 by any of various known types of anchor means indicated by numeral 10 at the beveled end for holding the reinforcing member against circumferential movement on the body. Another portion of the wrapping comprises a plurality of wraps 5 of uniform spacing on a portion of the pipe section distant from the beveled end.

The beveled end portion of the body 2 on which the nonuniformly spaced wraps are disposed is herein referred to as the short side portion designated 7a and the long side portion designated 8a with the shortest lengthwise dimension of the body 2 having the nonuniformly spaced wraps designated x and the longest lengthwise dimension designated y in the drawings for explanation purposes. More specifically, the spacing or pitch designated a between the wraps along the shortest lengthwise dimension x of side portion 7a is approximately the same throughout this length x and the spacing or pitch designated b between wraps along the longest lengthwise dimension y of side portion 8a is approximately the same throughout this length. Further, the spacing or pitch of the uniform wrapping will preferably be equal in length to the spacing b and is so designated in the drawings.

The tension in the reinforcing member for nonuniformly spaced wrap at the beveled surface of the beveled end portion shown in FIG. 2 may be varied for each progressive wrap in a manner illustrated schematically in FIG. 3. The concrete pipe section 2 is encompassed by a line 11 representing tension by radial distance on the reinforcing member for each wrap. The tension in the reinforcing member at any point on the pipe which is measured along a radial distance is a minimum at circumferential midpoint of the short side portion 7a as designated T-1 and progresses to a maximum at the circumferential midpoint of long side portion 8a as designated T-2 and then returns to a minimum tension T-1 at the circumferential midpoint of the short side portion 7a for each wrap. Stated another way, the end portion of the pipe section may be separated into a short half 7a and a long half 8a by vertical plane designated P-P passing through its center. The tension of each wrap of the reinforcing member is of lesser degree along the short half than along the long half as is illustrated by a radial distance comparison on each side of plane P-P. The tension in the reinforcing member 4 is proportioned for each wrap in the progressively increasing and decreasing manner as is illustrated in FIG. 3 to provide a similar stress exerted on the end portion of the beveled pipe section 2.

The tension in the reinforcing member or force applied to the payoff end is regulated in a manner shown in FIG. 3 to

coincide with the change in spacing between adjoining wraps on the end portion of the pipe section having the nonuniformly spaced wrapping. As shown the spacing between adjoining wraps from the circumferential midpoint of the short side portion 7a to the circumferential midpoint of the long side portion 8a increases progressively and from the circumferential midpoint of long side portion 8a to the circumferential midpoint of the short side portion 7a decreases progressively. Similarly as the spacing increases between each wrap the tensioning member progressively applies forces to a greater adjoining area of pipe section and as the spacing decreases between each wrap the reinforcing member applies forces to a lesser area of the pipe section. Therefore, by controlling the tension in the reinforcing member in increments circumferential of the pipe in a manner as shown in FIG. 3 more nearly balanced compression or stresses may be established throughout an end portion of a reinforced beveled pipe section.

The beveled end portion of the concrete pipe section 2 in FIG. 4 has a reinforcing member 12 which is wrapped or wound with spacing similar to FIG. 2 and in addition is provided with a pair of opposing anchors or holding assemblies 13 and 14 disposed at the juncture of the long and short side portions or halves 7a and 8a or in a vertical plane Q-Q dividing the pipe section into long and short side portions 7a and 8a. These holding assemblies may be of various types arranged and secured on the outer surface of the pipe section so that each wrap fitted thereon will be held against circumferential movement. These holding assemblies 13 and 14 preferably extend throughout the lengthwise extent of the nonuniformly wrapped end portion of the body 2 as shown.

In this position the tension in the reinforcing member may be controlled as shown in FIG. 5 by a line 15 about the pipe section 2 representing tension by radial distance so that there is substantially uniform tension along the short half 7a and an increased and uniform tension along the long half 8a on the end portion of the pipe section having nonuniformly spaced wraps.

In FIGS. 6 and 7 a system in generally schematic diagram form is shown for further explanation of the above described product and for describing a method of making said product. As shown the beveled pipe section 2 is disposed in an upright position on a rotary table 21. The table is driven through a suitable mechanical coupling by a motor 22 preferably electric. An overhead guide or support 23 is provided for stabilizing the upper beveled end of the pipe section during its rotary movement on the table 21.

The reinforcing member or wire 24 extends from a wound drum 25 and an end thereof is initially secured on the concrete pipe section at a point distant from or oppositely of the beveled end which may be located at various points throughout its lengthwise extent as required. Rotation of the pipe section 2 in the counterclockwise direction as viewed in FIG. 6 will then serve to wrap the reinforcing member 24 on the pipe section. A spacer assembly 26 which moves vertically adjoining the pipe section will space the wraps as required. A braking device 27 is coupled to the drum 25 so as to brake the rotary motion of the drum thereby applying a selected degree of tension or pulling force to the payoff end of the reinforcing member 24 during its wrapping on the pipe section.

A pickup device 28 is mounted adjoining the table for sensing the angular position of the pipe section. A tension control stage 31 is responsive to the pickup device 28 through line 32 and adjusts the braking device through line 33. A drive control stage 34 is responsive to the change in the braking device and adjusts the speed of the drive motor 22 through lines 35 and 36, coupled between motor 22 and stage 34, line 37 coupled between stages 31 and 34 and line 38 coupled between brake 27 and stage 31.

As an example, the braking device 27 and drive motor 22 may be direct current motors. The brake stage 27 may have a winding which adjusts the torque on its output shaft coupled to the drum 25 in accordance with the voltage applied thereto.

In this case the control stage 31 would change the voltage setting at line 33 on each half revolution so as to increase the torque and thus the tension in the reinforcing member 24. The drive motor 22 would also have a separate winding connected to lines 35 and 36 so that a change in torque in motor 27 would produce a change in voltage at lines 37 and 38 and thereby adjust the motor 22 to increase its torque and maintain the table rotary at a constant speed when the tension on member 24 increases.

In this manner the tensioning force exerted in the reinforcing member as it is being wrapped may be decreased or relieved on one half of the periphery of the pipe section and maintained or increased on the other half of the periphery as shown in FIGS. 3 and 5 while the table is rotated at a substantially constant speed.

While the present invention has been described with reference to particular structure, there is no intent to limit the spirit and scope to the precise details except as defined in the appended claims.

We claim:

1. A reinforced concrete structure comprising a hollow concrete body, tension means including an elongated reinforcing member wrapped around the hollow concrete body in a continuous helical pattern of multiple wraps throughout the lengthwise extent of the reinforcing member, said tension means being wrapped under different degrees of tension at different points on the periphery of said body by alternately applying a different degree of tension to the reinforcing member along one side portion of the concrete body than along another side portion during said wrapping, and means for holding said tension means against circumferential movement on said body whereby said tension means is maintained at the different degrees of tension at which said tension means was wrapped at the different points on the periphery of said body.

2. Tubular reinforced concrete as set forth in claim 1 wherein a vertical plane passing through the center of the body divides the body into a short side and a long side, and said wraps of the reinforcing member being under a different degree of tension on said long side than on said short side.

3. Tubular reinforced concrete as set forth in claim 1 wherein said holding means is disposed in vertical plane dividing the concrete body into short and long portions for holding each wrap on the short portion of the body under a different tension than each wrap on the long portion of the body.

4. Tubular reinforced concrete comprising a hollow concrete body having at least one beveled end and an elongated reinforcing member disposed in a plurality of spaced wraps around the periphery of a beveled end portion of said body to form a continuous helical assembly along a length of the body with each wrap of said reinforcing member being secured under a lesser degree of tension along a selected side portion of the concrete body than along another side portion of the concrete body, and means for holding said helical assembly against circumferential movement on said body.

5. Reinforced concrete structure as defined in claim 1, in which the means for holding the tension means hold said helical assembly against circumferential movement on said body to provide a more nearly balanced stress in the reinforcing portion of said structure.

6. Reinforced concrete structure as defined in claim 1, in which said body has at least one beveled end, and the tensioning is established by alternately applying a lesser degree of tension to the reinforcing member during said wrapping along the short side portion of the body and a greater degree of tension to the reinforcing body during wrapping along the long side portion.

7. The invention recited in claim 1, wherein said tension means forms a plurality of wraps around said body.

8. The invention recited in claim 1, wherein said tension means forms a continuous helical wrap around said body.

9. The invention recited in claim 1, wherein: said hollow concrete body has a beveled end portion, said beveled end portion having a long and a short side; and

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said tension means is wrapped around said beveled end portion under a first degree of tension on said long side and a second degree of tension on said short side, said first degree of tension being greater than said second degree of tension.

10. The invention recited in claim 9, wherein:

holding assemblies engaging said tension means are mounted on opposite sides of said beveled end portion midway between said long and short sides, said holding assemblies being operable to hold said tension means on said long and short sides at said first and second degrees of tension, respectively.

11. Tubular reinforced concrete as set forth in claim 1, including a hollow concrete body having at least one beveled end and an elongated reinforcing member disposed in a plurality of spaced wraps around the periphery of the beveled end portion of said body to form a continuous helical assembly along a length of the body with each wrap of said reinforcing member being secured under a lesser degree of tension along a

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selected side portion of the concrete body than along another side portion of the concrete body, and means for holding said helical assembly against circumferential movement on said body.

12. Tubular reinforced concrete as set forth in claim 11 wherein a vertical plane passing through the center of the body at the beveled end divides the body into a short side and a long side, and said wraps of the reinforcing member being under a lesser degree of tension on said short side than on said long side.

13. Tubular reinforced concrete as set forth in claim 11 wherein said holding means is disposed in a vertical plane dividing the beveled end of the concrete body into short and long halves for holding each wrap on the short half of the body under a lesser tension than each wrap on the long half of the body.

14. Tubular reinforced concrete as set forth in claim 11 wherein each of said plurality of wraps are unequally spaced.

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