Aug. 8, 1950 G. L. CHASE 2,517,974

CENTRIFUGAL CASTING APPARATUS

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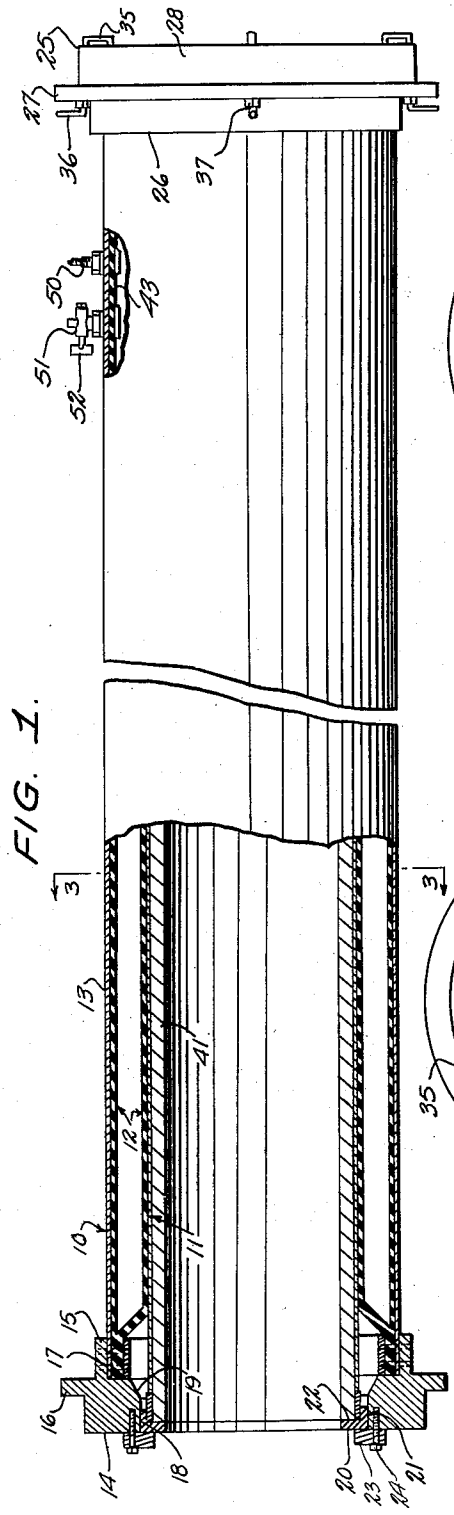


FIG. 1.

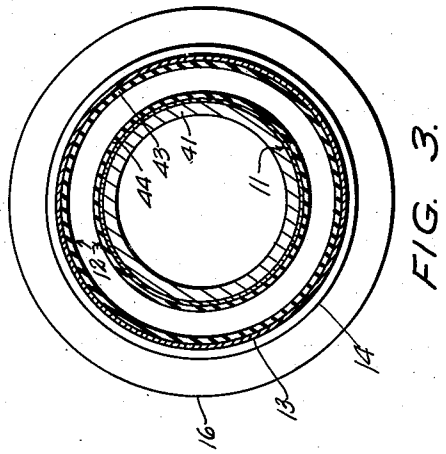


FIG. 3.

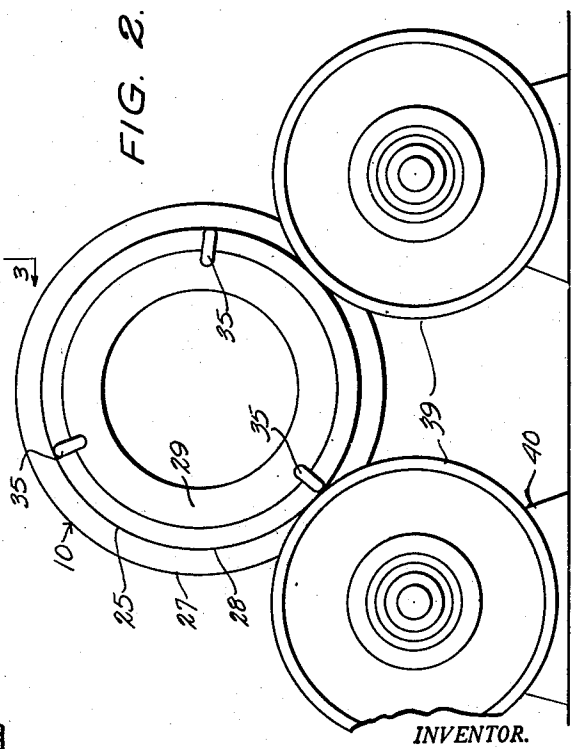


FIG. 2.

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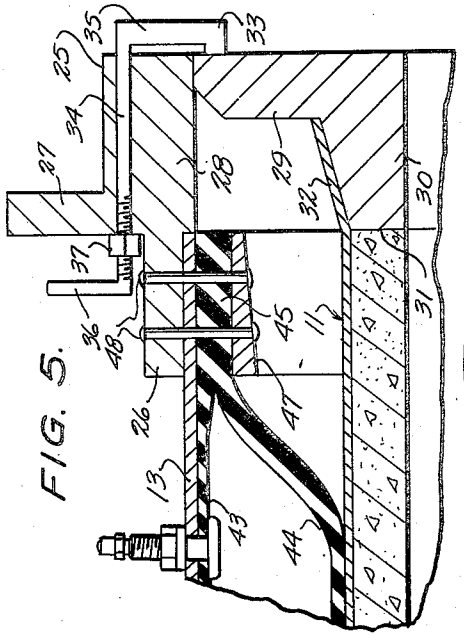


FIG. 5.

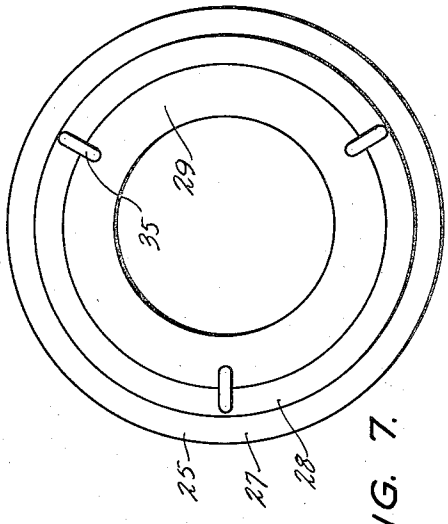


FIG. 7.

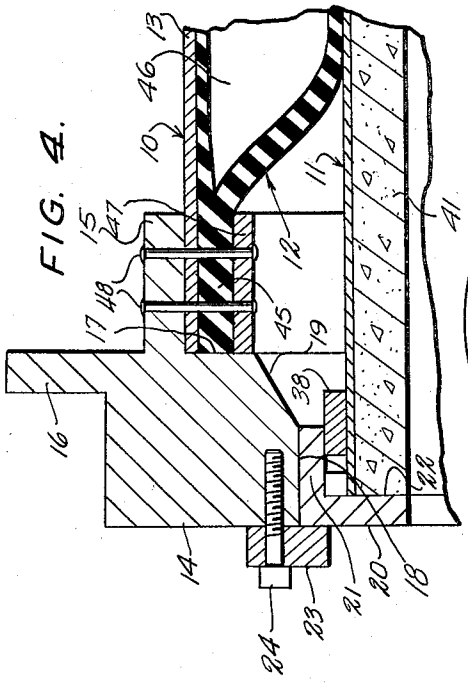


FIG. 4.

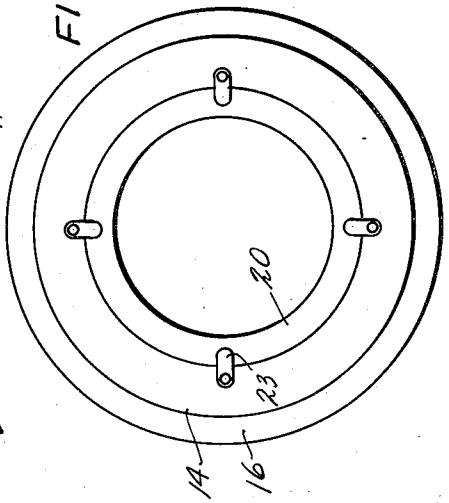


FIG. 6.

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CENTRIFUGAL CASTING APPARATUS

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6 Claims. (Cl. 25—30)

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This invention relates to centrifugal casting apparatus, and more particularly to improved apparatus for centrifugally casting concrete pipe or culvert sections and similar structures.

In centrifugally casting concrete pipe or culvert sections, it is customary to place a cylindrical, tubular frame having end rings therein, over a thin metal casing, secure removable rings, one in each end of the frame, surrounding the corresponding ends of the casing to hold the ends of the casing centered in the frame and extending annularly inward of the casing to provide abutments for a concrete lining cast in the casing, and then place the frame and included casing in horizontal position on a frame-spinning machine and feed plastic concrete into the interior of the casing until a concrete lining of a desired thickness has been provided in the casing.

In order to support the casing intermediate its length, hold the casing centered relative to the frame and provide a firm torsional connection between the casing and the frame, a girth band in the form of a split ring of rectangular cross-section is secured about the casing substantially at its mid-length location, and angularly spaced-apart set screws carried by the frame and extending radially inwardly of the wall of the latter are brought into contact with the girth band to center and support the casing in the frame and provide a driving connection between the frame and the casing.

This practice involves numerous objections and defects which it is among the objects of the present invention to overcome. For one thing, the casings are not of identical circumferential size, so that in some cases the girth band will fit loosely, permitting both rotational and radial movement of the casing in the frame and causing or permitting vibration of the assembly, and in other cases, will fit so tightly as to draw in the casing at the location of the band, distorting and frequently cracking the casing and setting up stresses which cause cracks in the concrete lining.

The use of the girth bands is also time consuming, requires a large amount of manual labor and results in an excessively high percentage of imperfect castings.

The present invention contemplates the elimination of the girth bands and the use of pneumatic means instead, and has among its objects the provision of improved means for centering and supporting the casings in the frames, and for firmly supporting the casings over substantially their entire length without distorting or

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damaging the casings to any extent, which supporting means provides a positive torsional connection between a frame and an included casing, which is quickly and easily operated to lock a casing in a frame and release it therefrom, which is resistant to wear, and effective to provide a long period of substantially trouble-free service, which will greatly reduce the percentage of imperfect castings produced, and which may be installed in a conventional tubular frame without material modification of the frame.

Other objects and advantages will become apparent from a consideration of the following description and the appended claims in conjunction with the accompanying drawings, wherein:

Figure 1 is a longitudinal elevation of a centrifugal casting tubular frame, a portion being broken away and shown in longitudinal, medial cross-section to illustrate the disposition therein of a tubular casing and concrete lining and pneumatic holding means operatively interposed between the frame and the casing;

Figure 2 is a somewhat diagrammatic end elevation of a loaded casting frame operatively mounted on a frame-spinning machine to produce a centrifugal casting;

Figure 3 is a transverse cross-section taken substantially on the line 3—3 of Figure 1;

Figure 4 is a longitudinal cross-section on an enlarged scale of a fragmentary end portion of the frame-and-casing assembly illustrated in Figure 1, showing the spigot end of the assembly;

Figure 5 is a longitudinal cross-section on an enlarged scale of a fragmentary end portion of the assembly illustrated in Figure 1, showing the bell end of the assembly;

Figure 6 is an end elevation of the spigot end of the frame-and-casing assembly; and

Figure 7 is an end elevation of the bell end of the assembly.

With continued reference to the drawings, the assembly illustrated in Figure 1 comprises, in general, a frame 10, a tube casing 11 received in and supported by the frame, and a pneumatic holding means 12 operatively interposed between the frame and the casing.

The frame 10 comprises a tubular, cylindrical member 13 of thin-walled construction formed of a hard, rigid and durable material, such as steel, and preferably of seamless construction. A runner ring 14 is permanently secured on one end of the tube 13 by means of an annular flange 15 exteriorly overlying the corresponding end of the tube and secured thereto by suitable fasteners, such as rivets or bolts. The ring 14 has an

outwardly-extending annular flange or bead 16 and extends inwardly of the tube 13 to provide an annular shoulder 17 at its inner side within the tube, a cylindrical inner-surface 18 of smaller diameter than the internal diameter of the tube 13, and a beveled annular edge 19 connecting the cylindrical surface 18 with the inner edge of the shoulder 17.

A spigot ring 20 of angle or L-shaped cross-section is mounted in the runner ring 14 in position such that its inwardly-projecting outer flange 21 receives the corresponding end of the tubular casing 11 and its radial flange projects inwardly of the tubular casing to provide an inwardly-extending annular shoulder 22 within the corresponding end of the tubular casing.

The spigot ring 20 is releasably secured in the runner ring 14 by angularly-spaced buttons 23 secured to the runner ring by respective bolts or cap screws 24 and receives the spigot through which concrete is introduced into the mold or frame 10.

A runner ring 25, particularly illustrated in Figure 5, is permanently secured to the bell end of the frame tube 13 by an annular flange or ring 26 which receives the corresponding end of the tube 13 and is secured thereto by suitable fastening elements. This ring has an outwardly-projecting annular bead or flange 27 corresponding to the bead 16 of the ring 14, and has a cylindrical portion 28 projecting outwardly from the corresponding end of the tube 13 which cylindrical portion 28 has a cylindrical, internal surface substantially flush with the internal surface of the tube 13. A bell ring 29 of L or angle-shaped cross-section has a cylindrical, peripheral surface of a diameter to closely fit into the cylindrical inner-surface of the portion 28 of the ring 25 and an inwardly-projecting, annular flange 30 of a thickness to provide a lining-retaining shoulder 31 within the corresponding end of the casing 11. This end of the casing is outwardly flared, as indicated at 32 to provide a bell end, and the other annular surface of the flange 30 of bell ring 29 is tapered to closely fit the outwardly-flared end of the casing.

The bell ring 29 is secured in the runner ring 25 and in the corresponding end of the casing 11 by suitable buttons 33, each of which has a shank 34 extending through a bore provided in the ring 25 longitudinally thereof, an angular portion 35 at the outer end of the shank overlying and operatively engaging the outer surface of the bell ring adjacent the edge thereof, and a handle 36 projecting substantially at right angles to the shank at the inner end thereof and in a direction opposite that from which the corresponding angular portion 35 projects. Adjacent the handle the shank 34 is externally screw threaded and a nut 37 is threaded onto the shank to rigidly lock the buttons in operative position, holding the bell ring 29 in the runner ring 25.

The above-described construction is already in use and its operation is substantially as follows:

The spigot ring 20 and the bell ring 29 are both secured in operative position on the casing, one at each end thereof, and the girth band is secured about the middle of the casing. The spigot ring 20 is secured in centered position on the casing by suitable means, such as wedges 38 forced between the annular flange 21 of the spigot ring and the outer surface of the casing. The buttons 33 are turned outwardly relative to the center of the runner ring 28, and the casing with the attached rings is then up-ended with the spigot

ring at the top. The frame 10 is elevated above the ground in a substantially vertical position above the casing and is then lowered over the casing and spigot ring until the spigot ring contacts the buttons 33. The buttons 33 are then turned inwardly to engage the outer surface of the bell ring near the outer circumference thereof, and the nuts 37 are tightened to hold the bell ring in firm engagement with the casing. This entire assembly is then placed on the spinning machine with the flanges 16 and 27 of the runner rings at the inner side of respective pairs of frame-supporting wheels 39 of the spinning machine, with the cylindrical portions of the runner rings at the outer sides of the flanges running on the peripheral surfaces of the wheels.

The wheels 39 are journaled on a frame 40 and driven by a suitable power source, so that the frame-and-casing assembly is rapidly rotated about a substantially horizontal axis. An elongated, tubular nozzle, from a cement gun supplying cement or concrete under pressure, is then inserted into the casing through the spigot ring 20 and concrete is placed in the casing between the shoulders 21 and 31 to the radial depth of these shoulders, providing within the casing 11 a concrete lining 41. The spinning of the frame-and-casing assembly causes this concrete lining to level out and take a cylindrical shape of substantially uniform thickness within the casing 11.

After the concrete lining has set, the spinning is stopped and the lined pipe or culvert section is removed from the frame by up-ending the assembly with the bell ring 29 at the bottom, loosening the nuts 37 and turning the buttons 33 out of the way of the bell ring, and then raising the frame away from the lined casing 11.

As explained in the introduction, it is customary, at the present time, to apply a girth band to the casing substantially at its mid-length location before the frame is lowered over the empty casing, and to then secure this girth band in centered position in the frame to support the intermediate part of the casing by threading set screws inwardly through the wall of the frame.

The present invention contemplates the elimination of the girth band and set-screw mechanism, and the use of pneumatic means within the frame to resiliently support the casing in the frame substantially from one end to the other of the casing. This pneumatic means comprises a double-walled, tubular structure, generally indicated at 12, extending from one end to the other of the frame tube 13. The walls of this structure 12 are thin and are formed of a flexible, air-impervious material, such as rubber or a rubber-and-fabric composition. Preferably the outer wall 43 and the inner wall 44 are united at their ends, as indicated at 45, to provide between the intermediate portions of the outer and inner walls, an air-tight chamber 46. The inner wall 44 is somewhat longer than the outer wall 43 and is resiliently stretchible so that it will extend across the annular space between the frame tube 13 and the casing 11 to contact the outer surface of the casing while the outer wall contacts the inner surface of the frame tube, as is clearly illustrated in Figures 1, 4 and 5.

The united end portions of the tubular structure 12 are firmly secured to the frame by means of flat rings 47 of elongated, rectangular, cross-section fitted one within each end portion of the flexible tubular structure, and secured to the frame by the rivets 48 which extend through the rings 45, the united end portions of the tubular

structure 12, the frame tube 13 and the frame tube-receiving flanges 15 and 26 of the runner rings 14 and 25, to simultaneously secure the pneumatic tubular structure 12 and the runner rings to the frame tube.

The rings 47 at the bell-ring end of the frame are preferably tapered in thickness from the inner to the outer edge to facilitate entry of the spigot ring 20 into the interior of the frame when the frame is being placed over a pipe casing.

An air-inlet valve 50, of conventional construction, is secured in the wall of the frame tube 13 and extends through this wall and through the outer wall 43 of the double-walled, pneumatic structure, for the admission of compressed air into the chamber 46 between the walls 43 and 44 of the pneumatic device, and an air-outlet valve 51, which may also be of conventional construction, extends through the wall of the frame tube 13 and the outer wall 43 of the pneumatic structure to the chamber 46 between the walls 43 and 44, and is provided with a manually-operated handle 52 for quickly releasing compressed air from the chamber 46 within the pneumatic structure 12.

With the tubular, pneumatic structure 12 operatively installed in the frame 10, as described above, when the frame is lowered over a pipe casing 11 and after the bell ring 29 has been brought to operative position, valve 51 is closed and compressed air is admitted through air-inlet valve 50 into the space between the outer and inner walls 43 and 44 respectively of the pneumatic structure 12, forcing the inner wall 44 of this structure into firm contact with the outer surface of the pipe casing 11. Because of the equal pressures surrounding the casing and exerted between the casing and the frame tube, the casing will be centered in the frame and will be firmly supported over substantially its entire area from one end to the other, and the pneumatic structure will provide an effective torsional driving connection between the frame and the casing for spinning of the assembly while the concrete is being applied to the interior of the casing.

An air compressor of suitable capacity, preferably having a storage tank associated therewith, will be provided, so that the chamber 46 within the pneumatic structure can be quickly filled with compressed air, thereby saving large amounts of time at present utilized in installing the girth band on the casing and threading the set screws into proper contact with the periphery of the girth band. As the compressed air is applied by mechanical means, this arrangement also saves an important amount of manual labor. When it is desired to remove the finished pipe or culvert section from the frame, it is only necessary to remove the bell ring 29, release the air from the chamber 46 through the air-release valve 51, and then lift the frame away from the finished pipe section. Here again, there is an important saving in the time and manual labor. Because of the firm and uniform support of the casing substantially throughout its entire length with resilient compensation for variations in casing size and other factors, no stresses are set up in the casing which would result in imperfect pipe sections, because of the accurate centering of the casing there is little or no vibration of the casing-and-frame assembly on the spinning machine, and because of the firm, uniform support of the casing and lack of vibration, the present hazardous condition of the frames breaking or exploding while on the spinning machine, is substantially eliminated.

The walls of the pneumatic structure 12 may be formed of either pure rubber or of a rubber-and-fabric or other composition, as may be found convenient or desirable, and, if the frame tube 13 is found to be of sufficiently air-tight construction the outer wall 43 of the pneumatic structure may be eliminated, the air chamber 46 then being formed between the flexible inner wall 44 and the inner surface of the frame tube.

While the invention has been particularly illustrated and described for use in the spinning of concrete pipe or culvert sections, it may obviously be used in other applications, such as in centrifugally casting concrete piling, fence posts and other structures, without, in any way, exceeding the scope of the invention.

The invention may be embodied in other specific forms without departing from the spirit or essential characteristics thereof. The present embodiment is, therefore, to be considered in all respects as illustrative and not restrictive, the scope of the invention being indicated by the appended claims rather than by the foregoing description, and all changes which come within the meaning and range of equivalency of the claims are, therefore, intended to be embraced therein.

What is claimed is:

1. An apparatus for centrifugally casting concrete pipe or culvert sections including a cylindrical, tubular frame for concentrically receiving tubular pipe casings, annular runner ring secured to said tubular frame at respectively opposite ends thereof, an inner ring releasably secured one in each runner ring for holding the ends of a casing in centered position in the frame, and pneumatic means in said frame between said runner rings for firmly supporting the intermediate portion of a pipe casing in centered position in said frame.

2. An apparatus for centrifugally casting concrete pipe for culvert sections including a cylindrical, tubular frame for concentrically receiving tubular pipe casings, annular runner ring secured to said tubular frame at respectively opposite ends thereof, an inner ring releasably secured in each runner ring for holding the ends of a casing in centered position in the frame, and pneumatic means in said frame between said runner rings for firmly supporting the intermediate portion of a pipe casing in centered position in said frame, said pneumatic means comprising a tubular, thin-walled structure of flexible material disposed in said frame, means firmly connecting the ends of said tubular structure to said frame interiorly of the latter, and an air valve secured in the wall of said frame and communicating with the space between said frame and said tubular structure for the admission of compressed air into said space.

3. An apparatus for centrifugally casting concrete pipe or culvert sections including a cylindrical, tubular frame for concentrically receiving tubular pipe casings, annular runner ring secured to said tubular frame at respectively opposite ends thereof, an inner ring releasably secured in each runner ring for holding the ends of a casing in centered position in the frame, and pneumatic means in said frame between said runner rings for firmly supporting the intermediate portion of a pipe casing in centered position in said frame, said pneumatic means comprising a double-walled, tubular body of flexible material disposed in said frame between said

runner rings, means firmly securing the ends of said tubular structure to said frame interiorly of the latter, and an air valve extending through the wall of said frame and the outer wall of said tubular structure for the admission of compressed air into the space between the two walls of said double-walled, tubular structure.

4. An apparatus for centrifugally casting concrete pipe or culvert sections including a cylindrical, tubular frame for concentrically receiving tubular pipe casings, annular runner ring secured to said tubular frame at respectively opposite ends thereof, an inner ring releasably secured in each runner ring for holding the ends of a casing in centered position in the frame, and pneumatic means in said frame between said runner rings for firmly supporting the intermediate portion of a pipe casing in centered position in said frame, said pneumatic means comprising a double-walled, tubular body of flexible material disposed in said frame between said runner rings, means firmly securing the ends of said tubular structure to said frame interiorly of the latter, an air-inlet valve extending through the wall of said frame and the outer wall of said tubular structure for the admission of compressed air into the space between the two walls of said double-walled, tubular structure, and a manually-operated, air-release valve mounted in the wall of said casing and communicating with the space between the two walls of said double-walled, tubular structure.

5. An apparatus for centrifugally casting concrete pipe or culvert sections and including a cylindrical, tubular frame for concentrically receiving tubular pipe casings and having annular rings secured one to each end thereof, and inner rings releasably secured one in each of said runner rings for holding the ends of the pipe casing in centered position in the frame, pneumatic means in said frame between said runner rings for firmly supporting a casing in centered position in said frame, and means firmly securing the ends of said pneumatic means to said tubular frame, said pneumatic means comprising a tubular, thin-walled structure of flexible material in said frame, and said means connecting said pneumatic means at its ends to said frame comprising a pair of rings of elongated, rectangular cross-section disposed one in each end of said

frame adjacent the corresponding runner rings and overlying the corresponding ends of said tubular pneumatic structure, and fastening elements extending through said rings, the end portions of said tubular pneumatic structure and the wall of said frame to firmly secure said tubular structure to said frame at the ends of the former and interiorly of the latter.

6. An apparatus for centrifugally casting concrete pipe or culvert sections including a cylindrical, tubular frame for concentrically receiving tubular pipe casings, annular runner ring secured to said tubular frame at respectively opposite ends thereof, an inner ring releasably secured in each runner ring for holding the ends of a casing in centered position in the frame, and pneumatic means in said frame between said runner rings for firmly supporting the intermediate portion of a pipe casing in centered position in said frame, said pneumatic means comprising a tubular structure having an inner and an outer wall of thin, flexible, air-impervious material, such two walls being united at their ends to provide between them an air chamber, said pneumatic means being disposed in said frame between said runner rings, means firmly securing the ends of said tubular structure to said frame interiorly of the latter, an air valve extending through the wall of said frame and the outer wall of said tubular structure for the admission of compressed air into the space between the two walls of said double-walled tubular structure, and a manually-operated air-release valve mounted in the wall of said casing and communicating with the space between the two walls of said double-walled tubular structure to release compressed air from the space between the inner and outer walls of said structure.

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