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VIBRATING STRUCTURE FOR CONCRETE PIPE FORMING MACHINE

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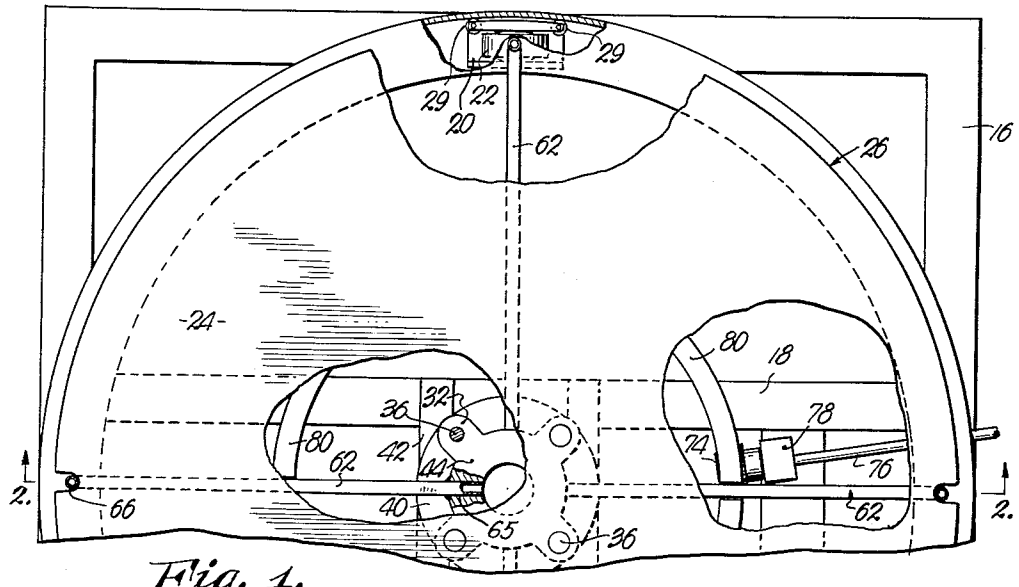


Fig. 1.

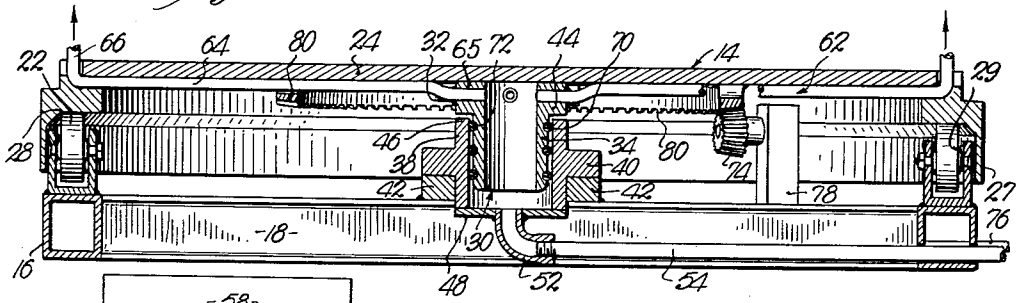


Fig. 2.

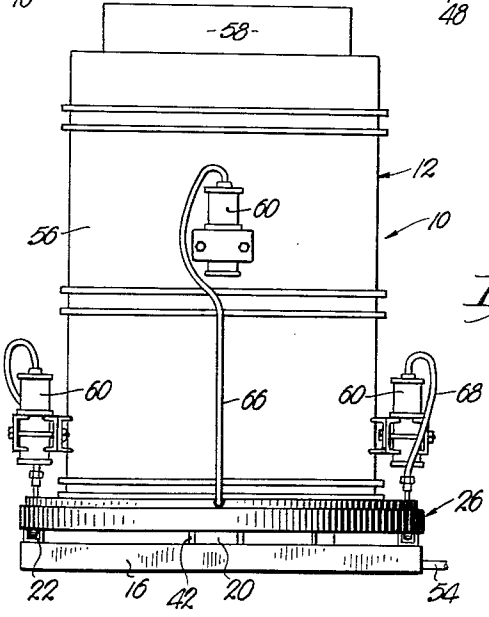


Fig. 3.

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VIBRATING STRUCTURE FOR CONCRETE PIPE FORMING MACHINE

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This invention relates broadly to the field of structure forming machinery and more specifically, to apparatus for forming concrete pipe wherein the wet cement may be poured directly into the form structure from a fixed point as the form is rotated.

Various types of concrete pipe forms have been previously suggested but such forms have not been entirely satisfactory for the reason that it has been heretofore necessary to either turn the pipe form around manually so that the wet concrete may be poured into different places in the form or, in the alternative, move the mixer truck to various locations around the form so that the concrete may be poured into different locations within the form. Manifestly, the problems presented are greatly increased in the production of very large concrete pipes, especially those of the order of six feet in diameter and several feet in length, which are adapted for use as culverts beneath highways and other similar drain constructions.

Another process previously practiced consisted of pouring the wet concrete from the mixer truck into a hopper, then subsequently lifting the hopper above the form with a crane or other suitable device so that the wet cement may be poured from the hopper into the form through a movable sleeve which will extend to any position above the form. This method has been successfully practiced in many instances, but required a considerable quantity of expensive equipment, as well as additional manpower, and was impractical from a time standpoint.

It is well known that the strongest pipe is formed by utilization of concrete wherein the aggregate contained therein is well distributed and there is little if any segregation of the lighter, smaller particles from the larger, heavier ones. The hopper-movable sleeve arrangement described above has been found to contribute to segregation of the particles inasmuch as it is necessary to pour the wet concrete into a hopper prior to direction of such cement into the pipe form structure. The heavier particles tend to gravitate to the bottom of the hopper during the trip from the mixer truck to the swingable sleeve and thus, one end of the pipe which is subsequently formed contains a greater proportion of the smaller, lighter particles while the other end has been found to contain a higher proportion of the larger, denser aggregate particles.

Another difficulty encountered with the most commonly used method utilizing a hopper and swingable sleeve is the entrapment of air bubbles within the wet concrete as the same is initially poured into the hopper and then subsequently directed into the form structure through the swingable sleeve. Manifestly, air in the wet concrete leaves voids or pockets in the wall of the pipe which reduce the compressive strength of the pipe and weakens the overall structural strength characteristics of the completed pipe.

Attempts have been made in the past to eliminate the air bubble problem in the concrete by providing vibrators on the form structure, however, the power lines to such vibrators have not only been cumbersome and in the way of the pouring sleeve but the air entrapped in the lowermost portion of the pipe has been removed by vibration of the form.

It is, therefore, the most important object of this invention to provide apparatus for forming concrete pipes wherein the wet concrete may be poured into the form structure from a fixed point without the formation of air bubbles in the completed pipe which would impair the physical strength characteristics of the pipe structure.

It is another important object of the present invention to provide apparatus for forming concrete pipe wherein the form structure is mounted on a rotatable turntable in a position to receive wet concrete from a fixed point as the turntable and the form structure rotate, so that the wet concrete can be continuously poured into the form at a relatively slow rate and in the form of a thin stream, to thereby eliminate most of the air bubbles normally entrapped in concrete pipe during pouring of the cement.

Also an important object of this invention relates to apparatus for forming concrete pipe as described wherein there is provided vibrator mechanism on the form structure to vibrate the same as the turntable and the form rotate, as well as novel means connected to the vibrators for continuously supplying power to the same during rotation of the turntable and the form and which do not in any manner interfere with pouring of wet concrete into the form.

Other important objects of the present invention relate to the provision of apparatus for forming concrete pipes wherein segregation of light and heavy particles in the concrete poured into the form structure is eliminated because of the fact that the concrete is poured directly from the mixer truck into the form structure; to the provision of form structure having pneumatically operated vibrators on the external surface thereof to vibrate the structure during pouring of the concrete and wherein there is provided novel air distribution means mounted on the turntable for continuously supplying air under pressure to the vibrators to actuate the same during rotation of the turntable; to the provision of a central, tubular hub depending from the turntable and suitably coupled with the vibrators on the form structure, as well as a tubular sleeve partially telescoped over and rotatably receiving the hub and connected to a suitable source of air under pressure to the end that the air is continuously delivered to the vibrators through the sleeve, hub and conduits during rotation of the turntable and the form structure; to the provision of sealing means between the hub and the sleeve surrounding the same so that escape of air from the same is prevented during rotation of the turntable; and to other lesser important objects and details of construction which will become obvious as the following specification progresses.

In the drawing:

FIGURE 1 is a fragmentary plan view of the turntable forming a part of the present invention and from which the pipe forming structure has been removed;

FIG. 2 is a fragmentary, vertical, cross-sectional view of the turntable and its associated parts as illustrated in FIG. 1; and

FIG. 3 is a side elevational view on a reduced scale of apparatus for forming concrete pipe embodying the concepts of the present invention and showing the pipe forming structure in place on the turntable.

Apparatus for forming concrete pipe wherein the wet cement may be poured directly into the form from a fixed point is illustrated in the drawing and broadly designated by the numeral **10**, such apparatus including as basic components, form structure **12** and a turntable **14**.

Apparatus **10** may be constructed in a manner to be somewhat portable and therefore, relatively easily moved from one position to another, but, in any event, includes a polygonal base **16** constructed of tubular elements and provided with a pair of spaced I-beams **18** suitably connected to opposed members of base **16** as shown in FIG. 1. A number of upwardly opening, U-shaped members **20** secured to the upper faces of the

tubular elements of base **16** each rotatably support a roller **22** there within, rollers **22** being disposed for rotation on horizontal axes that intersect at a common point. A circular plate **24** is positioned over base **16** for rotation on rollers **22** and includes an annular, peripherally disposed runner **26** depending from the under face of plate **24** and provided with an annular, upright flange **27** defining an inner circular track **28** which receives rollers **22**, it being noted that opposed outer faces of members **20** are arcuate in configuration to conform with the curved inner surfaces of track **28** while the outer leg-portion of members **20** are provided with rollers **29** rotatable on vertical axes, and engageable with the inner surface of flange **27** to guide plate **24** during rotation thereof.

An elongated, tubular hub **30** which includes a spider portion **32** and a cylindrical portion **34** is centrally mounted on the underside of the plate **24** by bolt means **36** passing through spider portion **32** into plate **24**. A generally cylindrical sleeve **38** provided with an integral, outwardly extending, annular flange **40** on the external surface thereof is telescoped over and rotatably receives cylindrical portion **34** of hub **30**. The normally lower portion of flange **40** rests upon cross bars **42** secured in a suitable manner to I-beams **18**, and a ring **44** positioned over cylindrical portion **34** of hub **40** against spider portion **32** is rotatable about the innermost end **46** of sleeve **38**. A centrally perforated disk **48** having an L-fitting **52** within the perforation thereof closes the lowermost open end of cylindrical portion **34** of hub **30**. An elongated supply conduit **54**, threaded into the outermost end of fitting **52**, and passing through base **16**, is connected to a continuous supply of air under pressure (not shown).

Plate **24** removably receives form structure **12** and which normally includes an outer section **56** as well as an inner form section **58** spaced from section **56**, and between which sections the wet concrete is poured to form a concrete pipe. A plurality of pneumatically operated vibrators **60** are suitably secured to the outer face of section **56** and as illustrated in FIG. 3, vibrators **60** are preferably disposed at 90° intervals around the peripheral surface of section **56** and are normally disposed in vertically spaced relationship so that both the lowermost and uppermost parts of form structure **12** are suitably vibrated.

An elongated, rigid conduit **62** is provided for each of the vibrators **60** and includes a horizontal stretch **64** disposed beneath the lower face of plate **24**. The innermost ends of each of the stretches **64** of conduits **62** extend into and are welded within corresponding passages **65** through spider portion **32** of hub **30** and thus, each of the conduits **62** communicates with the interior of hub **30**. The outer stretches **66** of each of the conduits **62** are turned at right angles to stretch **64** and extend upwardly through the outer peripheral margin of plate **24** to a position above the upper face of the latter. Elongated flexible conduits **68** are connected to and communicate with corresponding conduits **62** and vibrators **60** so that air may be directed to each of the vibrators **60** from the suitable source of supply.

In order to prevent escape of air from hub **30** and sleeve **38** as turntable **14** rotates, a plurality of circumferentially spaced O-rings **70** are provided between the inner surface of sleeve **38** and the outer surface of cylindrical portion **34** of hub **30** and, in order to maintain O-rings **70** in proper spatial relationship, each of the O-rings **70** is positioned within corresponding annular grooves **72** formed in the outer surface of cylindrical portion **34** of hub **30**.

Turntable **14** is rotated at a predetermined rate by a bevel gear **74** connected to power shaft **76** through gear box **78** mounted on plate **79** spanning the distance between I-beams **18** connected to base **16**, and it can be seen from FIG. 2 that bevel gear **74** in turn meshes with a ring gear **80** attached to and depending from the under face of plate **24**.

In operation, form structure **12** is positioned on rotatable plate **24** in a manner so that the axes of sections **56**, **58** and plate **24** are in alignment and the flexible conduits **68** are suitably connected to corresponding pneumatic vibrators **60** and stretches **66** of air conduits **62**. Thereupon a mixer truck is moved into position adjacent form structure **12** so that the sleeve thereof is located in a position to direct wet concrete into the space between sections **56** and **58**. The prime mover (not shown) attached to shaft **76** is actuated to rotate gear **74** and in turn, turntable **14**, as well as form structure **12**, and the air supply connected to conduit **54** is turned on so that air under pressure is directed continuously and simultaneously to each of the vibrators **60** through conduit **54**, fitting **52**, sleeve **38**, hub **30**, conduits **62** and conduits **68**. The pneumatically operated vibrators **60** vibrate form structure **12** as turntable **14** is rotated, and the wet concrete is slowly directed into form structure **12** as plate **24** is rotated and vibrators **60** actuated by the air directed into the same under pressure.

It can be appreciated that the wet concrete is introduced into the space between sections **56** and **58** in a spiral manner and thus, there is no need to move the mixer truck or to employ hopper means so that the wet cement may be introduced around the entire periphery of form structure **12**.

By utilization of apparatus **10**, it can now be appreciated that wet cement may be introduced into structure **12** from a fixed point while the form structure is continuously rotated in one direction. Thus, the wet concrete is poured into form structure **12** in a spiral rather than as in prior methods wherein the form structure was oscillated back and forth. The novel means for continuously and simultaneously directing air to all of the vibrators **60** on structure **12** throughout continuous rotation of turntable **14** in one direction completely eliminates the utilization of overhead supply conduits which were in the way and became easily entangled in the wet cement pouring equipment.

Apparatus **10** has solved all of the above mentioned problems, and segregation of the lighter particles from the heavier ones in the wet cement is completely eliminated and entrapment of a considerable quantity of air in the wet cement during the pouring operation is prevented because of the continuous pour method of spirally directing the wet cement into form structure **12**. The entire pouring operation may now be carried out with a minimum of equipment, manpower and time.

Having thus described the invention what is claimed as new and desired to be secured by Letters Patent is:

1. In apparatus for forming concrete pipe, a rotatable turntable; pipe form structure mounted on said turntable for rotation therewith and disposed in a position to receive wet concrete from a fixed point as the turntable and said structure are rotated; vibratory mechanism including a pneumatically operated vibrator and bracket means securing said vibrator to the outer surface of said form structure for rotation of the mechanism with said structure; a tubular hub centrally mounted on said turntable; air distribution means carried by said turntable and connected to and communicating with said vibrator and the hub respectively; a stationary sleeve partially telescoped over and rotatably receiving said hub; and stationary conduit means connected to said sleeve for continuously delivering air under pressure to the vibrator through said sleeve, the hub and said distribution means during rotation of the turntable, the structure and said mechanism to thereby actuate the vibrator and effect vibration of the structure as wet concrete is poured into the same.

2. Apparatus as set forth in claim 1 wherein is pro-

vided sealing means between said hub and the sleeve for preventing escape of air therefrom.

3. Apparatus as set forth in claim 2 wherein said sealing means includes a plurality of spaced, circumferentially extending O-rings engaging the inner surface of the sleeve and the outer surface of the hub respectively.

4. Apparatus as set forth in claim 3 wherein said hub is provided with a circumferentially extending groove in said outer surface thereof for each of said O-rings respectively.

5. In apparatus for forming concrete pipe, a rotatable turntable; pipe form structure mounted on said turntable for rotation therewith and disposed in a position to receive wet concrete from a fixed point as the turntable and said structure are rotated; a plurality of spaced, pneumatically operated vibrators; bracket means rigidly securing each of said vibrators to the outer surface of said form structure whereby the latter rotate with said structure; a cylindrical hub centrally mounted on said turntable and depending therefrom; a conduit on the turntable for each vibrator respectively, each of said conduits being connected to and communicating with a corresponding vibrator and the hub respectively; an elongated, stationary sleeve partially telescoped over and rotatably receiving said hub, the outermost end of said sleeve extending downwardly from said hub; an L-shaped, tubular fitting secured to said outermost end of the sleeve; means connected to said fitting for continuously delivering air under pressure to the same during rotation of the turntable, the structure and said mechanism to thereby actuate the mechanism and vibrate the structure as wet concrete is poured into the same.

6. In apparatus for forming concrete pipe, a rotatable turntable; pipe form structure mounted on said turntable for rotation therewith and disposed in a position to receive wet concrete therewithin from a fixed point remote from the turntable as the latter and said structure are rotated; pneumatically operated vibratory mechanism including a power actuated vibrator and bracket means rigidly securing the vibrator to the outer surface of said form structure; elongated conduit means carried by said turntable and operably coupled at one end thereof to

said vibrator for supplying air under pressure to the latter during rotation of the form structure and thereby the vibrator; stationary sleeve means receiving therewithin at one extremity thereof, the opposite end of said conduit means and adapted to be operably coupled with a source of pneumatic power for supplying air under pressure to said movable conduit means as the form structure and said vibrator are rotated; and means on said sleeve means and said opposite end for rendering the latter and thereby said turntable rotatable relative to said sleeve means and for sealing said one extremity of the latter.

7. In apparatus for forming concrete pipe, a rotatable turntable; pipe form structure mounted on said turntable for rotation therewith and disposed in a position to receive wet concrete from a fixed point as the turntable and said structure are rotated; pneumatically operated vibratory mechanism including a vibrator and bracket means rigidly securing the vibrator to the outer surface of said form structure; air distribution means on said turntable and operably coupled with said mechanism; and stationary sleeve means adapted to be operably coupled to a source of pneumatic power and telescopically receiving therewithin said air distribution means for rotatably mounting thereon said air distribution means and thereby said turntable and for placing the air distribution means in fluid communication with said source when the latter is coupled with said sleeve means whereby air under pressure is continuously delivered to said distribution means and thence to the mechanism during rotation of said turntable to thereby actuate the mechanism and vibrate the structure as set concrete is poured into the same.

References Cited in the file of this patent

UNITED STATES PATENTS

720,053	McKibben	Feb. 10, 1903
1,984,863	Clark et al.	Dec. 18, 1934
2,585,756	Eschenbrenner	Feb. 12, 1952
2,614,312	Rankin et al.	Oct. 21, 1952
2,839,278	Rowe	June 17, 1958