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J. R. CURRAN

2,786,252

APPARATUS FOR FORMING DENSE COATING ON PIPE

Filed July 27, 1951

2 Sheets-Sheet 1

FIG. 1.

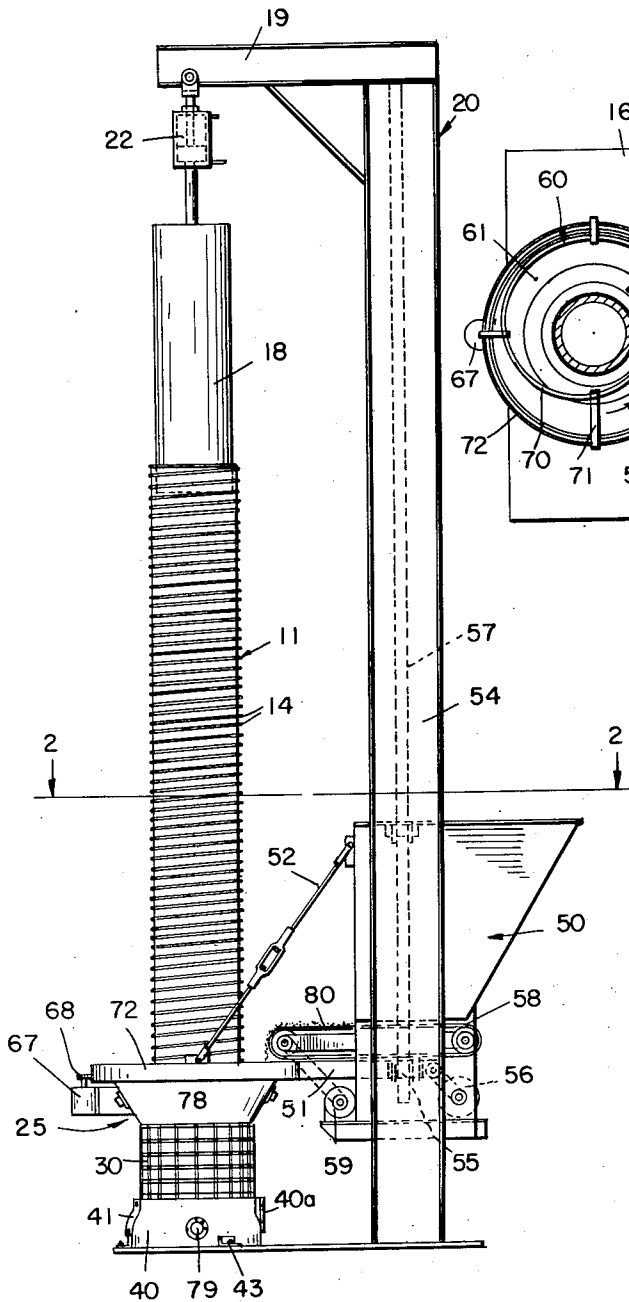
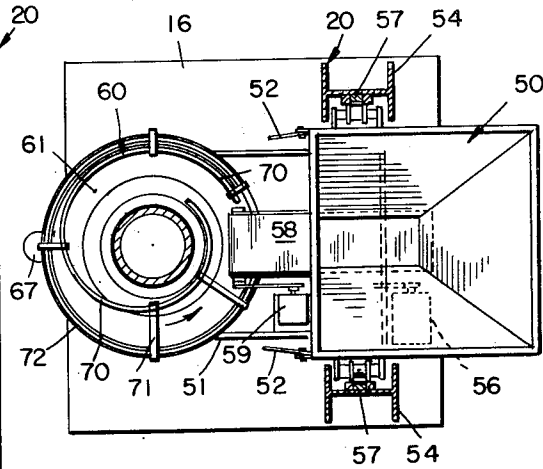


FIG. 2.



INVENTOR
JOHN R. CURRAN
BY

W. Mason & Chaham

ATTORNEYS

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J. R. CURRAN

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2 Sheets-Sheet 2

FIG. 3.

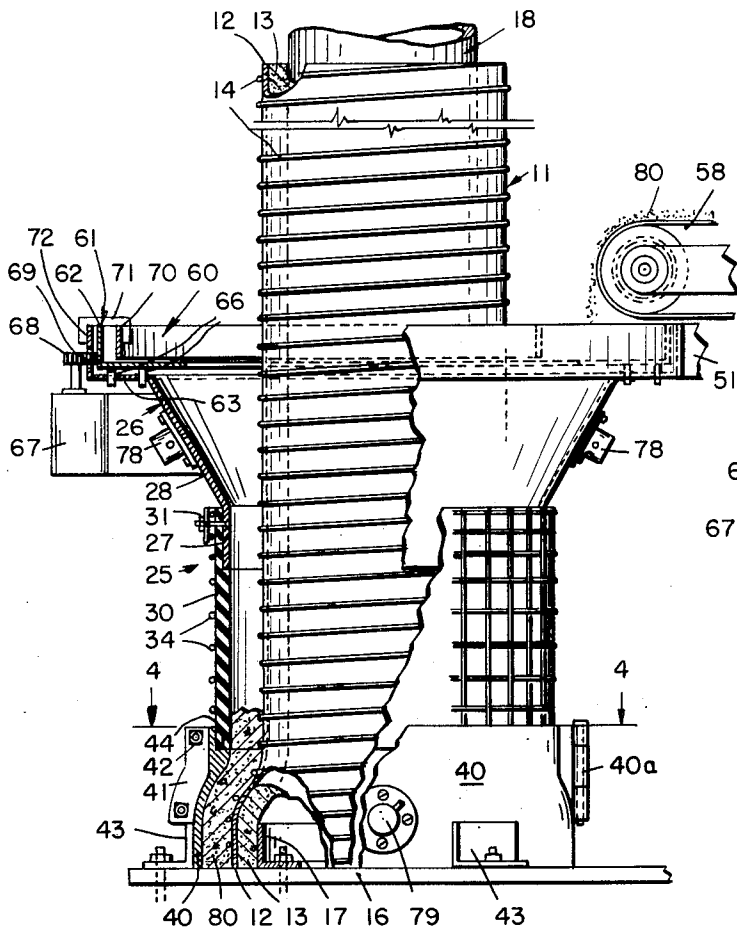


FIG. 5.

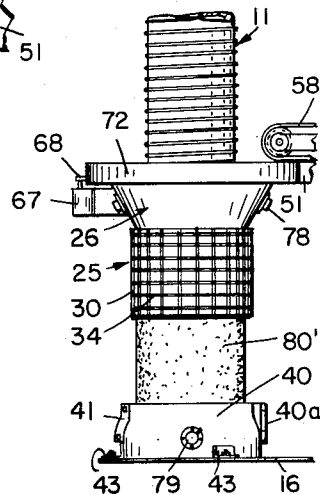


FIG. 7.

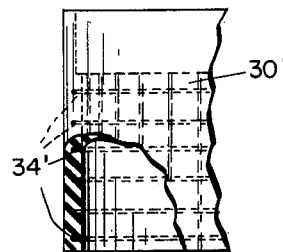


FIG. 4.

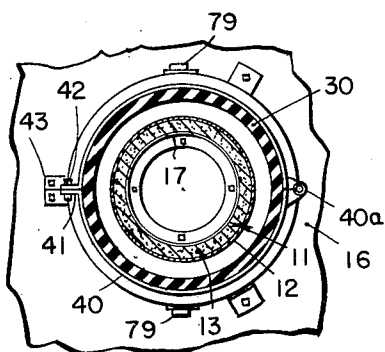
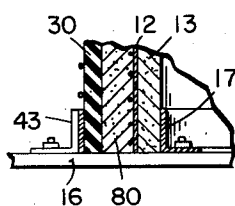


FIG. 6.



INVENTOR

JOHN R. CURRAN

BY

Mason & Graham

ATTORNEYS

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2,786,252

APPARATUS FOR FORMING DENSE COATING ON PIPE

John R. Curran, Downey, Calif., assignor to American Pipe and Construction Co., a corporation of Delaware

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5 Claims. (Cl. 25—38)

This invention has to do with making concrete pipe, particularly pipe having a metal shell with wire wrapped therearound under tension and having an inner wall of concrete inside the metal shell and an outer wall of concrete on the outside of the shell.

In making pipe of the type referred to above, the inner wall of the concrete is usually cast first, customarily by the centrifugal casting method. The partially completed pipe is later placed in a stationary mold and concrete poured therein to form the outer wall of the pipe. In some cases the mold is vibrated to assist in compacting the concrete. This method has proved objectionable in some instances, particularly where it has been attempted to use relatively dry concrete mixes in the outer wall of the pipe. In speaking of concrete, I refer to concrete made of hydraulic cement, such as Portland cement, sand, gravel, and water. The difficulty has been that it has been found impossible to obtain a smooth, dense, outer wall of concrete about the metal shell. As a result, the outer wall is unduly porous and admits moisture to the metal shell and metal reinforcement wire, and since these parts are customarily made of steel, the pipe is subject to corrosion and rusting.

It therefore is an object of this invention to provide a new and improved apparatus for casting the outer wall of concrete about a metal shell and any reinforcement members thereabout to provide a relatively dense and smooth outer wall of concrete in such pipe.

A further object is to provide a novel method and novel apparatus for casting concrete pipe which enables the use of relatively dry concrete mixes and insures the proper compacting of the mix in the form.

A general object of the invention is to provide a novel apparatus for casting an annular wall of concrete about a form or other object.

These and other objects will be apparent from the drawing and the following description thereof.

Referring to the drawing:

Fig. 1 is an elevational view of apparatus embodying the invention showing a partially completed pipe on which an outer wall of concrete is to be formed;

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

Fig. 3 is an elevational view, partly in section, of a portion of the apparatus of Fig. 1 on a larger scale;

Fig. 4 is a section on line 4—4 of Fig. 3;

Fig. 5 is a partial elevational view of the apparatus of Fig. 1 in operation;

Fig. 6 is a fragmentary sectional view disclosing the use of the apparatus in the making of a pipe which is cylindrical from end to end; and

Fig. 7 is a fragmentary sectional view of an alternate form of skirt member.

More particularly describing the invention, in the drawings I show at 11 a partially completed concrete pipe which has a metal shell 12 lined interiorly with concrete 13. Reinforcement wire 14 is wrapped around the shell, and this is usually under tension. The partially com-

2

pleted pipe 11 is shown resting on end on a base or floor 16 provided with a guide ring 17 adapted to fit inside the partially completed pipe to hold it in proper position. The upper end of the pipe is supported against lateral movement by a cylindrical guide mandrel 18 supported on an arm 19 of frame 20. A piston and cylinder unit 22 is utilized between the arm and the mandrel for raising and lowering the mandrel.

25 generally indicates my novel mold for forming the outer wall of concrete on the pipe. This mold comprises a tubular shell 26 having a short cylindrical section 27 and a flared or conoidal section 28. The shell is preferably made of metal. Attached to the lower end of the shell and forming a continuation thereof is a cylindrical skirt 30 which is formed of rubber or a rubber-like material. This member may be attached to the cylindrical section of the shell by bolts 31. The inner wall of the cylindrical section 27 of the shell and the inner wall of the skirt should register. The skirt preferably is reinforced, as by an exterior wire mesh cage 34. An alternate form of skirt, indicated by 30', having reinforcement wires 34' embedded in the rubber is shown in Fig. 7.

In the form of the invention disclosed in Figs. 1-5 the mold is shown associated with a bell mold section for the purpose of casting a bell end on the pipe. This bell mold section comprises a split or segmental ring 40 hinged at 40a which rests on the base 16 and is provided with flanges 41 and bolts 42 to secure the parts of the ring together. The ring in turn is held in proper position on the base by means of brackets 43. The ring is provided with an internal shoulder 44 against which the lower end of the skirt abuts when the mold 25 is in the lower molding position.

As will later appear, the mold 25 is raised during the casting operation. While various means can be used to accomplish this, I show the mold attached to a hopper 50 by means of a band 51 which extends around the upper portion of the mold and by steel rods 52. The hopper is mounted for vertical movement between I-beam uprights 54 of the frame 20 and for this purpose is provided with pinions 55 driven by a motor 56, the pinions meshing with vertical racks 57 on the uprights 54. The hopper is provided with a conveyer belt 58 driven by a motor 59 for conveying concrete to the mold 25.

For the purpose of distributing the concrete evenly around inside the mold 25 I provide a distributor 60. This includes a tray 61 having a circumferential wall 62. The tray is rotatably mounted on flange 63 of the shell 26 of mold 25, being supported on rollers 66. The tray is rotated by means of motor 67 and a pinion 68 thereon engaging ring gear 69 on the wall 62 of the tray.

The mold 25 also supports a spiral baffle plate 70 which is mounted within the tray upon suitable supports 71 attached to an upright wall 72 upon the flange 63 of the mold portion 28. It will be apparent that as the belt feeder delivers concrete to the tray, the rotation of the tray in the direction of the arrow on Fig. 2 serves to feed the concrete against the baffle with the result that the concrete is evenly distributed around the mold.

The mold 25 also is provided with one or more vibrators 78 for compacting the concrete, two vibrators being shown. These may be driven either electrically or by compressed air and should be of a type which produce vibrations of the order of approximately 7,000 or more per minute. Similar vibrators 79 are mounted on the sections forming the ring 40.

In the use of the apparatus of the invention, assuming the parts are in the position shown in Fig. 1, the vibrators 78 and 79 are started and concrete 80 fed gradually from hopper 50 into the upper end of the mold where it is distributed by the distributor 60 and falls by gravity into the space between the mold and the partially completed

pipe 11. After sufficient concrete has been added to form the bell portion of the pipe wall, and this has been compacted by the vibrators 79, these vibrators are stopped and the formation of the outer wall of the pipe is continued by feeding concrete into the upper end of the mold and gradually raising the mold (by causing upward movement of the hopper 50) with the vibrators 78 of the mold operating. This is continued until the wall is formed to the upper end of the pipe and slightly therebeyond. In Fig. 5 the mold 25 is shown partially raised and the formed wall of concrete below it is indicated by numeral 30'.

The speed at which the mold 25 can be raised depends upon several factors, but I have found that best results are obtained if the mold is raised at a speed not in excess of four feet per minute.

Where a straight cylindrical pipe without any bell end is to be formed, the form ring 40 is dispensed with and the skirt 30 originally placed in end-abutting relation to the base 16 as shown in Fig. 6. In the formation of the pipe, concrete is fed to the space between the partially completed pipe and the mold 25 and the mold gradually raised as concrete is fed to it with the vibrators thereon in operation.

I have found that the apparatus, when used as described, produces an extremely dense and hard wall of concrete. I believe this is due to the combined vibratory and troweling action of the flexible skirt 30 upon the concrete.

While I have shown and described the invention with reference to the making of a particular kind of pipe wherein my apparatus is used to apply the final layer or wall of concrete, I contemplate that the invention is also suitable for many other uses. For example, it may be used to form the entire concrete body of a concrete pipe in which case the concrete would be applied around an inner form which would later be removed. Also, the invention can be used to apply a concrete wall about a solid object. Also, while I have illustrated and described a preferred form of my invention, I contemplate that various changes and modifications can be made therein without departing from the invention, the scope of which is indicated by the following claims.

I claim:

1. An open-ended tubular mold for use in progressively building up a wall of concrete about an object by feeding concrete into one end of the mold and advancing the same from one end to the other end of the object, comprising a tubular metal shell for receiving concrete, vibrator means mounted on said metal shell, a tubular flexible skirt of rubber or like material secured to and forming a continuation of said metal shell adapted to trail said shell as the mold is advanced, and flexible reinforcement means for said skirt, said skirt being free and unrestrained beyond said shell except by said reinforcement means, said reinforcement means comprising spaced-apart elements providing open areas therebetween for flexure of said skirt in the region of said areas.
2. A mold as set forth in claim 1 in which said reinforcement means comprises wire mesh.
3. A mold as set forth in claim 1 in which said reinforcement means is on the exterior of the skirt.
4. A mold as set forth in claim 1 in which said reinforcement means is embedded in the material of said skirt.
5. A mold as set forth in claim 1 in which said tubular metal shell has a conoidal section at one end and a cylindrical section adjacent said skirt.

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