

Sept. 27, 1949.

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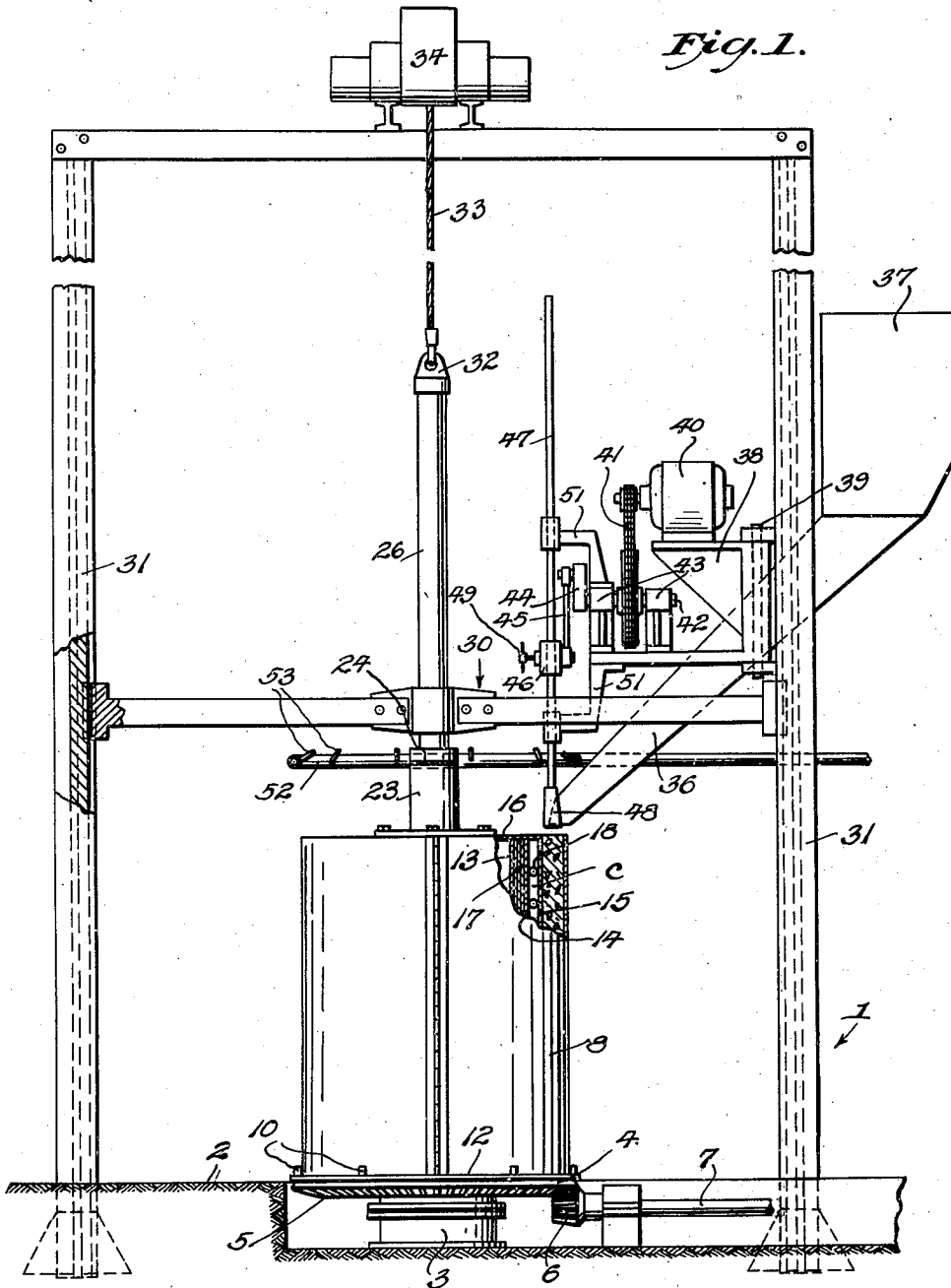
2,482,949

CONCRETE PIPE FORMING MACHINE

4 Sheets-Sheet 1

Filed March 29, 1946

Fig. 1.



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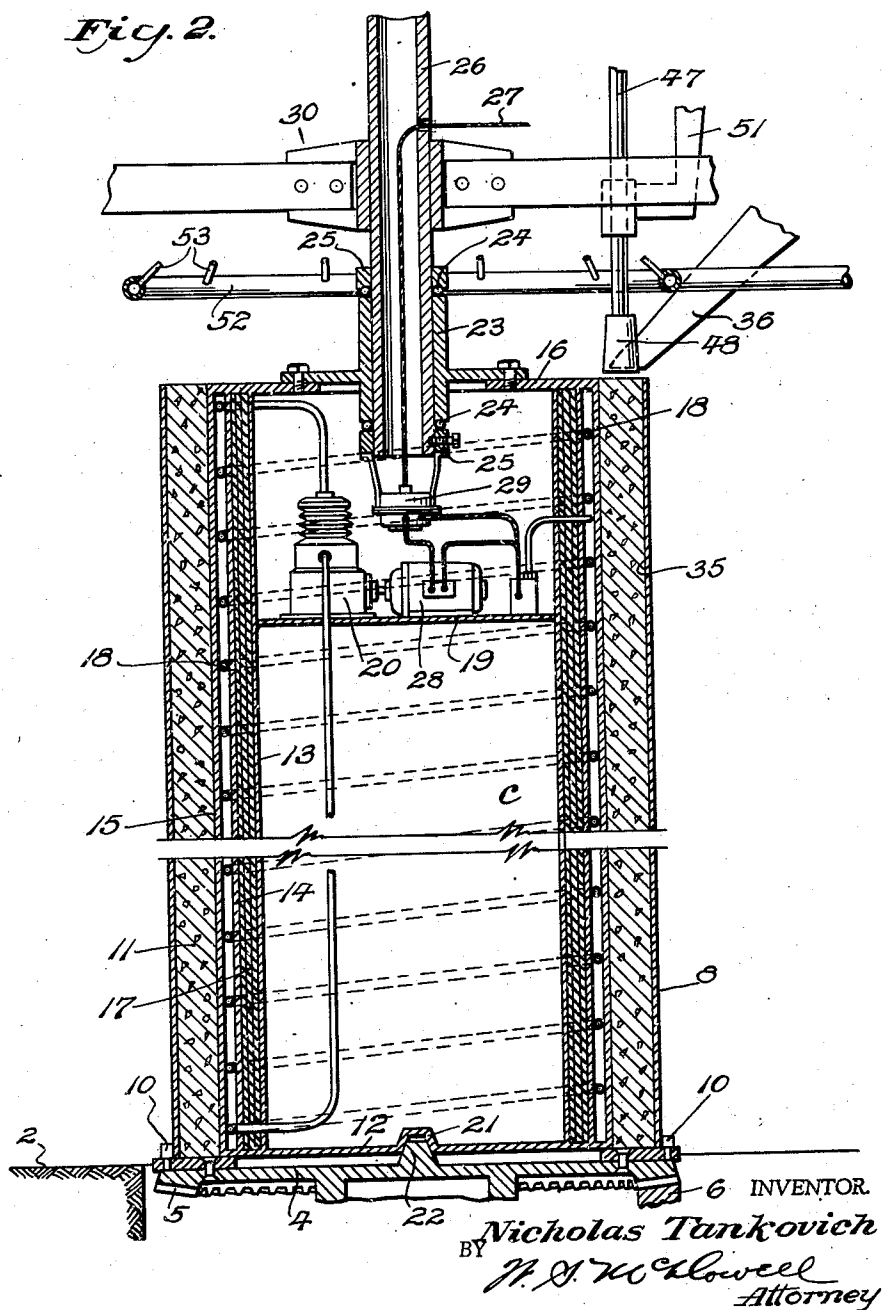
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Fig. 3.

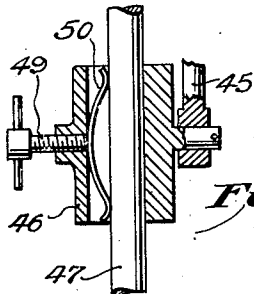
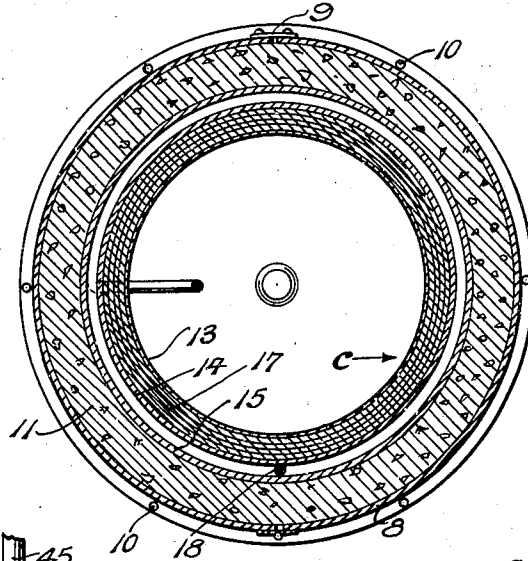


Fig. 5.

Fig. 4.

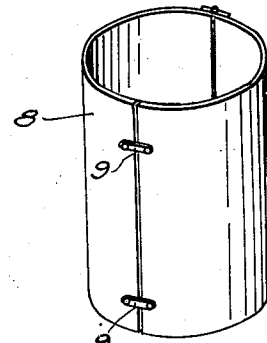
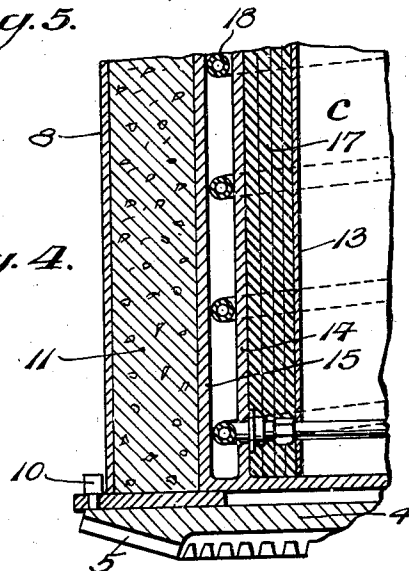


Fig. 6.

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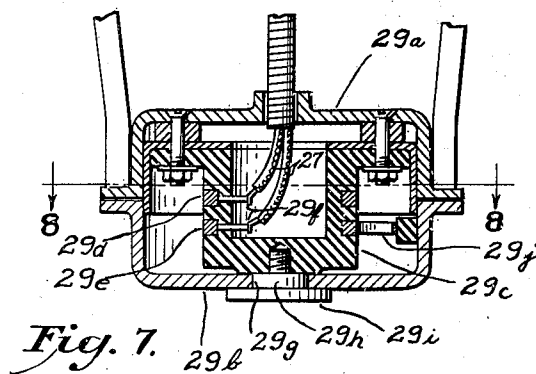


Fig. 7.

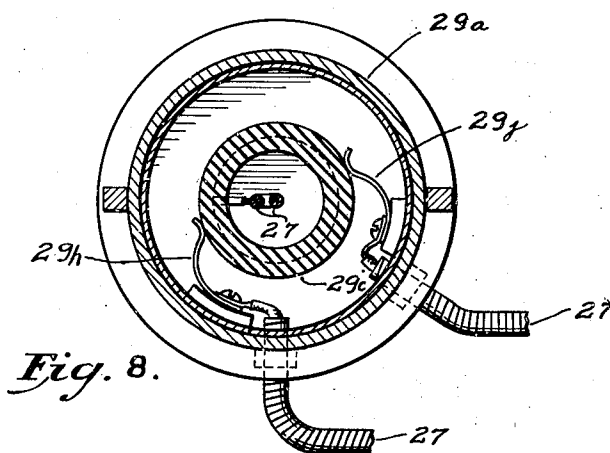


Fig. 8.

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CONCRETE PIPE FORMING MACHINE

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5 Claims. (Cl. 25—37)

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My invention deals with concrete pipe-forming machines, and more specifically to machines of this type incorporating an outer forming member, and an internal cylindrical core in spaced relation to the outer form, said spacing constituting the cementitious mix-receiving mold of the machine.

In the past, machines of this character have generally comprised a stationary cylindrical core and an outer rotatable form member in spaced concentric relation to one another, the spacing between said members constituting an annular chamber into which a cementitious mix is introduced for the pipe-molding process. In the molding process, the outer mold and mix are rotated about the stationary core. It will be manifest that in such an operation, a great amount of abrasive action takes place between the outer surface of the core and the body of mix, and that considerable power is wasted in overcoming the friction necessarily accompanying such abrasive action. It will also be noted in machines of this type, that the relative motion between the mix and the core continuously disturbs small particles of the soft concrete in engagement with the outer surface of the core, causing the inner surface of the pipe to be rough and uneven. Such unevenness is highly undesirable in the hardened finished product, from a sanitary engineering standpoint, as it tends to disturb the subsequent flow of liquid through the pipe and enhances the accumulation of moss and other foreign matter, occurring in the liquid, upon the inner walls of the pipe.

It will also be well to note that the length of the individual pipe section formed by such machines, is necessarily limited because of the great amount of power utilized to overcome this abrasive action and at the same time maintain rotation of the outer form or body of mix. It will be understood that the outer surface or lining of the core receives a high degree of frictional wear, and that the costs of replacing same necessarily increases the cost in the manufacture of concrete pipes.

It is therefore an object of my invention to provide a pipe-forming machine in which there is no relative rotational motion between the core and the concrete mix during the forming of the pipe sections.

It is another object of my invention to provide a concrete pipe-forming machine which produces a section of pipe having a high degree of smoothness upon its interior surface.

It is a further object of my invention to provide a pipe-forming machine in which the length of the pipe sections produced therein may be greatly increased by the utilization of the power, normally lost in overcoming abrasive action, to

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impart rotational movement to the molding members of the machine.

For a further and more detailed explanation of my invention, reference is made to the following description and the accompanying drawings, wherein:

Fig. 1 is a front elevational view, partly in vertical section, of a concrete pipe-forming machine constructed in accordance with the present invention;

Fig. 2 is an enlarged vertical sectional view disclosing the refrigerator core and outer form construction and the rotary table on which these parts are mounted;

Fig. 3 is a horizontal sectional view taken through the core and outer form member of the present pipe-forming machine;

Fig. 4 is a detail fragmentary vertical sectional view on a somewhat larger scale of the refrigerator core, the outer form and the supporting table;

Fig. 5 is a detail vertical sectional view of the tamping rod holder;

Fig. 6 is a detail perspective view of the sectional outer form.

Fig. 7 is an enlarged medial vertical sectional view taken through the rotatable switch casing embodied in the present invention;

Fig. 8 is a horizontal sectional view taken along the line 8—8 of Fig. 7.

Referring more particularly to the drawings, and to the specific embodiment of my invention therein set forth, the numeral 1 designates the frame structure of my improved pipe-forming machine, and the numeral 2 designates the base or foundation from which the frame structure arises. Arranged on the base or foundation, is a stationary bearing member 3, which carries a revoluble table 4 having a ring gear 5. Meshing with the teeth of the ring gear are those of a pinion 6, the latter being fixed on one end of a motor-actuated drive shaft 7. Adapted to be vertically positioned on the upper surface of the table 4 is a sectional outer form 8, the latter being composed of a pair of hingedly united semi-circular sections having latches 9 which hold the sections in cylinder-forming order. Removable positioning lugs 10 are carried by the table for the purpose of centering the form thereon and maintaining said form in concentric relationship with the axis of the table. The lugs 10 may be removed when the form is opened to permit of the removal from the table of a finished concrete pipe 11.

Adapted to be positioned on the table within the confines of the outer form and in spaced concentric relationship therewith, is a core structure which is indicated generally in the drawings by the letter C. The core structure

provides a cylindrical casing consisting of a bottom wall 12, relatively spaced, vertically disposed and concentrically arranged inner, intermediate and outer walls 13, 14 and 15, respectively, and a top wall 16. Preferably, the space between the inner and intermediate walls 13 and 14 is filled with a suitable form of insulation, as indicated at 17, and arranged in the space formed between the intermediate and outer walls is a coil 18 for the circulation of a refrigerant. The inner wall 13 is provided with a platform 19 on which is positioned the electrically actuated compressor unit 20 by which a refrigerant is supplied to the coil 18.

The bottom wall 12 of the core structure is formed with a centrally located socket 21 for the reception of a centering stud 22 which arises axially from the table 4. The top wall 16 has connected therewith a bearing sleeve 23, the upper and lower ends of which engage with anti-friction thrust bearings 24, the latter being confined between the ends of the sleeve 23 and a pair of spaced collars 25 which are fixed on the lower end of a tubular shaft 26 which extends axially and upwardly from the core structure. Current conductors 27 for the motor 28 of the compressor unit may pass advantageously through the shaft 26, the conductors passing through a switch casing 29 which is suspended from the lowermost of the collars 25, the arrangement permitting the rotation of the core structure with the table, but without disturbing the transmission of current to the motor 28.

Referring to Figs. 7 and 8 of the drawings, the switch casing 29 comprises a pair of detachably and rotatably connected upper and lower sections, 29a and 29b respectively, with the upper section 29a being formed with a centrally disposed opening for the passage of the ends of the current conductors 27 carried within the shaft 26. Rigidly carried by the upper section 29a, and depending therefrom is a circular dish-shaped insulating block 29c which is provided upon its outer surface with a pair of spaced metallic terminal bands 29d and 29e, to which are separately connected, as at 29f, the ends of the two current conductors 27. The lower casing section 29b is formed with a centrally disposed bearing opening 29g through which is introduced a bearing stud 29h which is formed with an enlarged and flat outer head 29i and an inner screw-threaded bolt portion rigidly carried within a cooperatively threaded socket formed in the bottom central portion of the insulating block 29c. In this manner, the lower section is joined with the upper section of the casing 29, but is free to rotate thereon. Carried within the lower section 29b and electrically insulated therefrom are a pair of metallic brush terminals 29j and 29k which are maintained under spring tension in wiping or sliding engagement with the separate terminal bands carried by the insulating block 29c. Electrically connected with each of the brush terminals are the ends of the motor extension of the current conductors 27. Thus it will be seen, that electrical current may be supplied interiorly of the rotatable core without interruption from the relatively stationary or non-rotatable shaft 26.

Secured to the shaft 26 is a cross head 30, the ends of which being grooved for sliding engagement with the vertical posts 31 of the frame structure 1. The upper end of the shaft 26 is formed with an end member 32 having an eye for

the reception of a swiveled hook formed on the lower end of a hoisting cable 33, the cable being attached to a motor driven winch or windlass 34 so that the core structure may be elevated or lowered as desired. With the outer form removed from the table and the core structure in an elevated position, it will be seen that the formed pipe 11 may be readily removed from the table 4. Following such removal, the core structure is lowered until it rests in a centered position on the table and the outer form is then arranged on the table and held by the lugs 10 in concentric relation about the core structure, so that the cementitious mix may be introduced into the annular pipe-forming space 35 provided between the outer surfaces of the core structure and the inner surfaces of the outer form. The cementitious mix is delivered to this annular space by means of the chute 36 extending from a hopper 37, the discharge end of the chute terminating immediately over said space when the core and form are actively positioned, as shown in Fig. 1. As the form structure revolves with the table 4, the mix is evenly distributed over the space area.

A tamping mechanism is provided, for the purpose of uniformly packing a mix within the pipe-forming space 35. Advantageously, this mechanism may comprise a bracket 38 which is pivotally mounted as at 39 for turning movement in a horizontal plane on the frame structure 1. Positioned on the bracket is an electric motor 40 which, through a chain and sprocket construction 41, drives a shaft 42, journaled in bearings 43 carried by the bracket. The outer end of this shaft is equipped with a crank 44 having pivotally connected therewith one end of a pitman rod 45, the other end of said rod being pivotally connected with a sleeve 46. Passing through the sleeve is a tamping rod 47, the latter having a head 48 at its lower end for engagement with the mix introduced into the form structure. The sleeve 46 carries an adjusting screw 49 which engages with the attached intermediate portion of a leaf spring 50, the ends of said spring having frictional engagement with the rod 47.

Supported in connection with the bracket 38 are guides 51 for stabilizing the tamping rod. By the operation of the crank 44, reciprocatory motion is imparted to the tamping rod, so that the head of the same engages the mix in the space 35, forcing the mix downwardly during the rotation of the form structure with the table so that voids are eliminated in the finished pipe. As the space 35 fills with the mix, the tamping rod is forced upwardly against the resistance offered by the spring 50, thereby maintaining a uniform tamping action.

The frame structure 1 carries a water spraying coil 52 having nozzles 53. When the core structure is being lowered from its elevated position, water is discharged from these nozzles to coat the outer surfaces of the core structure with the water so that this coating will freeze through the operation of the refrigerating coil 18, producing a thin film of ice on the outer surfaces of the core structure. When the cementitious mix is introduced into the space 35, this film of ice melts, but leaves the outer surfaces of the core structure coated with moisture, so that after the pipe-forming material has been fully poured, the core structure may be readily lifted without adherence on the part of the pipe-forming materials.

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Consideration of the foregoing will disclose that the present invention possesses many advantages over prior machines utilized in the manufacture of concrete pipe, particularly in the matter of lower power consumption, the production of pipe having smoother internal surfaces, the saving of cores and the liners therefor. In fact, the present machine permits the manufacture of any length or diameter of pipe. In most prior machines, the core is held rigidly in the machine with a yoke, and the outer mold revolves around the core with the concrete packed between the stationary core and the revolving mold. This condition creates friction and an abrasive action, and necessitates a great expenditure of power to effect the same. In the present construction, it will be noted that the core revolves in unison with the outer mold and the abrasive and friction action above mentioned is entirely eliminated. As a result of the concrete revolving around the stationary core in prior art machines, the intense rubbing action on the stationary core continuously disturbs small particles of the concrete, causing the inside of the pipe to become rough. When the pipe is in service, the rough inside surface disturbs water flow and accumulates undesirable sewer moss.

In my machine, water is applied to the outer surfaces of the revolving core. Because the refrigerant in the core is maintained at a temperature of the order of 15 to 20 degrees above zero, the water applied to the core freezes and forms a film of ice. When operation begins, concrete is poured between the mold and core and tamped. From the heat of the concrete, the existing ice on the core melts, producing a film of water which acts as a lubricant. In lifting the core out of the formed pipe, there is left on the inside of the pipe a smooth surface approximating that of glass.

With the use of prior machines, a new core liner is required for approximately every 1000 feet of pipe made. This procedure of changing core liners limits production and induces higher pipe costs. My improved refrigerated core does not employ a core liner and the life of the core is practically unlimited. Also in prior machines for making concrete pipe, the usual length of such pipe is 4 feet. The reason for this is attributable to the high abrasive action on the core and the limited driving power which can be applied thereto. Therefore, pipe in service requires the joints to be made at every 4 feet, a condition which retards the process of laying pipe and introduces more water friction into the pipe line. In my machine because a film of water acts as a lubricant between the core and the concrete, the said film permits the ready removal of the core out of pipe of any desirable length. Therefore, it reduces the number of joints in the finished pipe line by being able to produce pipe of greater length than is now possible.

While I have disclosed a preferred form of my improved machine, nevertheless, it will be understood that the structure is subject to certain modification or variation without departing necessarily from the scope of the following claims.

I claim:

1. In a concrete pipe-forming machine, a cylindrical core having an external refrigerated mix-engaging surface, means carried by said core for

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refrigerating said surface, an outer detachable form disposed about and spaced from said core, said spacing producing a mix-receiving chamber, a rotary platform-support for said core and said outer form, and liquid-discharging apparatus for applying liquid to the external mix-engaging surface of said core.

2. A concrete pipe-forming machine comprising a cylindrical outer form, an inner vertically movable and rotatable core having an outer cylindrical wall disposed in spaced concentric relation to said outer form, the spacing between said outer form and said core providing an annular cylindrical chamber for the reception of a pipe-forming mix, means to rotate said outer form and said core, means carried internally of said core for refrigerating the outer wall thereof, and means for applying a liquid to the outer cylindrical wall of said core.

3. In a concrete pipe-forming machine, a rotatable and vertically movable inner cylindrical core formed with an external mix-engaging surface, means for applying a liquid to the external surface of said core, electrically operated refrigerating means carried internally of said core for refrigerating the external surface thereof, said last-named means being operable to freeze a liquid upon the external surface of said core, and means engageable with one end of said core for imparting axial rotation thereto.

4. In a concrete pipe-forming machine, a cylindrical outer form, an inner vertically movable core having a cylindrical outer mix-engaging surface disposed in concentric spaced relation to said outer form and providing therewith an annular chamber for the reception of a pipe-forming mix, means for simultaneously rotating said outer form and said core, electrically operated refrigerating means integrally carried within said core for refrigerating the outer mix-engaging surface thereof, and sprinkler means for applying a film of water to the outer surface of said core upon vertical movement thereof, said refrigerating means being operable to freeze a film of water upon the outer surface of said core.

5. In a concrete pipe-forming machine, a rotatable and vertically movable cylindrical inner core formed with an outer mix-engaging surface, means for applying a film of water to the outer surface of said core, refrigerating means integrally carried within said core and rotatable therewith for refrigerating the outer surface of the core, said refrigerating means being operable to freeze a film of water applied to the outer surface of said core, and means engageable with one end of said core for imparting axial rotation thereto.

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