Dec. 5, 1944. J. FERLA 2,364,061

MACHINE FOR PRODUCING PIPES

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Fig. 1.

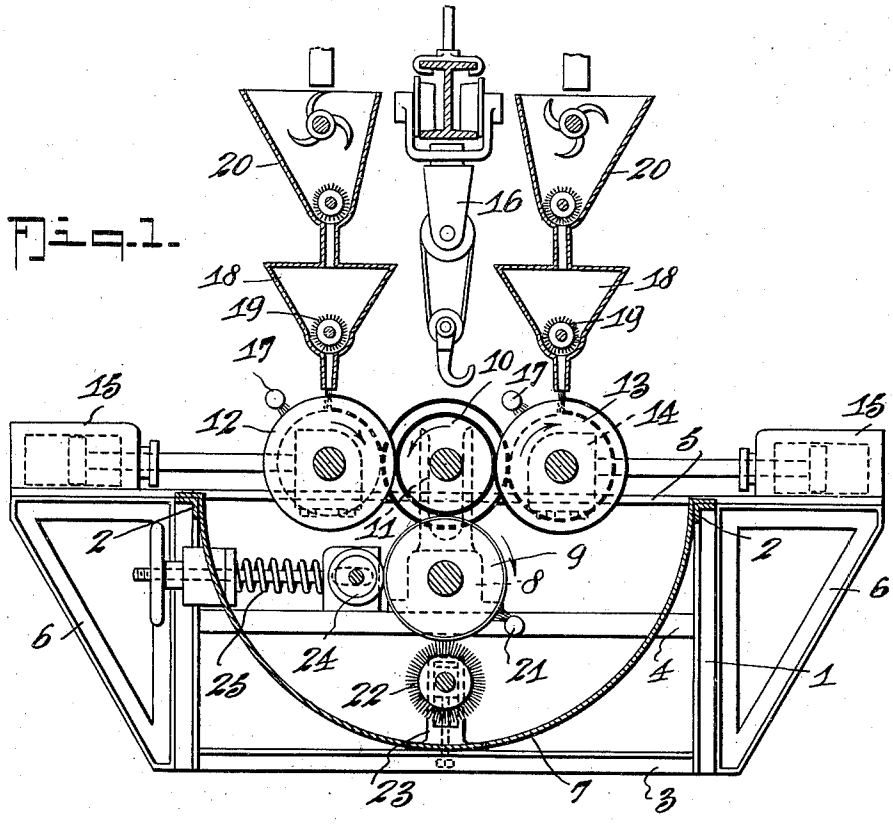


Fig. 2.

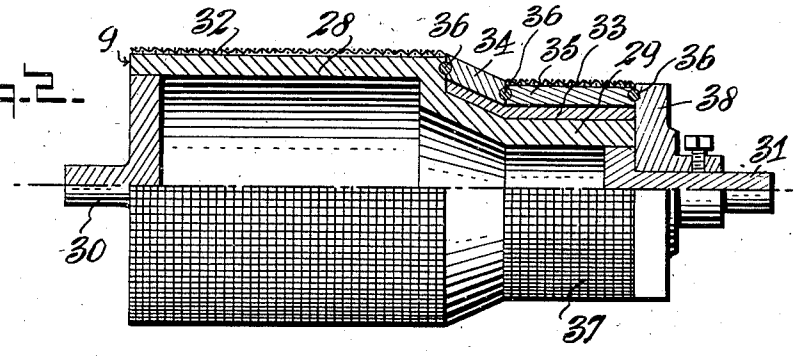
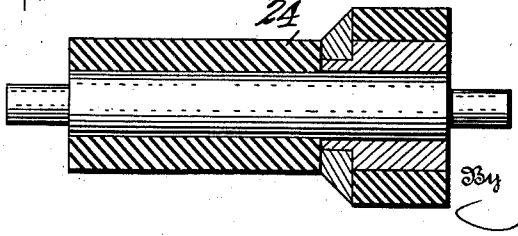


Fig. 3.



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Fig. 4.

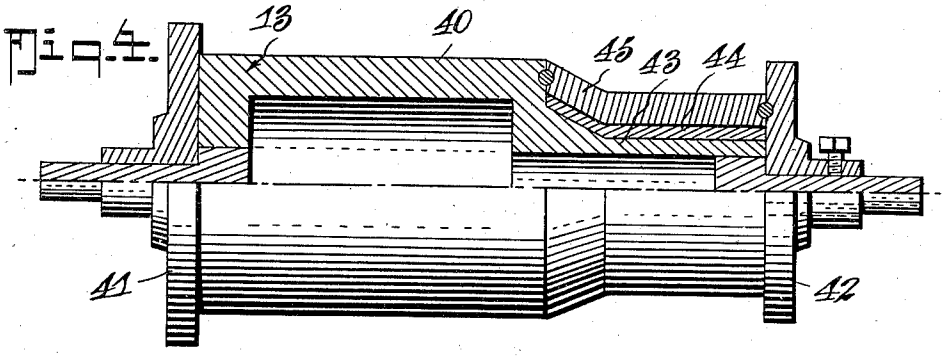


Fig. 5.

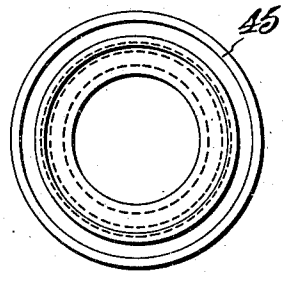


Fig. 6.

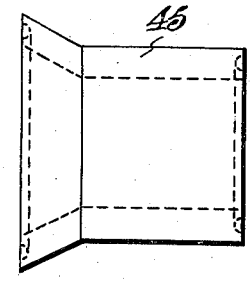


Fig. 7.

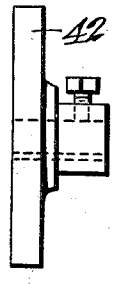


Fig. 8.

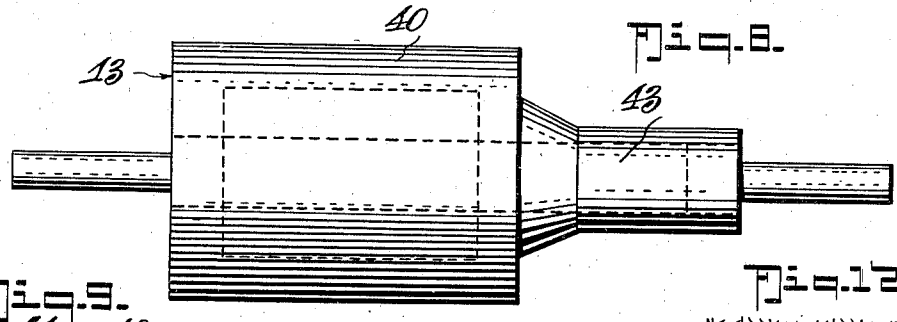


Fig. 9.

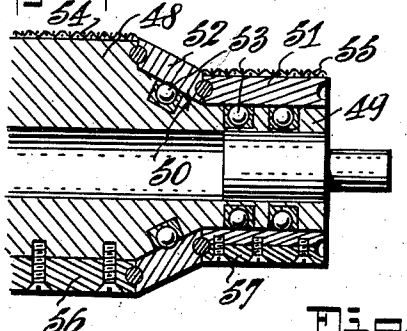


Fig. 10.

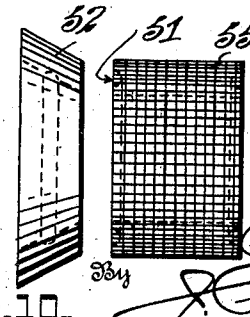


Fig. 12.



Fig. 11.

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2,364,061

UNITED STATES PATENT OFFICE

2,364,061

MACHINE FOR PRODUCING PIPES

John Ferla, Camden, N. J., assignor of one-fourth to Paul X. Blaettler, Oaklyn, N. J.

Application July 17, 1939, Serial No. 284,987

25 Claims. (Cl. 25—30)

This invention relates to pipe producing apparatus, and more particularly to the producing of pipes from cementitious material such as an asbestos cement mixture.

In forming pipes on a mandrel, a layer or layers of cementitious material is applied to the mandrel and rotated in contact with calender rolls for shaping and compacting the material, which calender rolls operate at the same circumferential speed as the mandrel. Where it is desired to form an integral bell collar on one end of the pipe, this requires a change of diameter therefor, as a result of which the bell-shaping portions of the mandrel and calender rolls should operate at different circumferential speeds than the remainder of the length thereof, but due to the integral construction of the mandrel and calender rolls as usually provided heretofore, such variations in speed has been impossible, and this resulted in imperfectly formed bell collars on the pipes.

The object of this invention is to provide for uniform circumferential speed between the bearing portions of the mandrel and calender rolls not only at the cylindrical portions thereof, but also at the bell-forming portions thereof, whereby perfect forming of the bell collar will be obtained without injury thereto.

In carrying out this object, I have provided a loosely mounted sleeve on the calender which may rotate free of the major portion thereof as a result of pressure between the mandrel and calender, whereby to obtain uniform circumferential speed not only at the cylindrical portion of the pipe, but also at the bell collar thereof, whereby the collar may be formed simultaneously with the cylinder of the pipe and without injury thereto, in a perfect manner.

I have shown in the accompanying drawings a preferred embodiment of the invention in which:

Fig. 1 is an elevation partly in section of an apparatus constructed in accordance with this invention;

Fig. 2 is a quarter section through a lower calender roll;

Fig. 3 is a longitudinal section through a wringer roll;

Fig. 4 is a longitudinal quarter section through a side calender;

Fig. 5 is an end elevation of a rotatable sleeve therefor;

Fig. 6 is a side elevation of said sleeve;

Fig. 7 is an edge view of an end flange therefor;

Fig. 8 is a side elevation of the calender body;

Fig. 9 is a partial longitudinal section through a calender;

Fig. 10 is an edge view of a conic sleeve therefor;

Fig. 11 is a side elevation of a cylindrical sleeve therefor; and

Fig. 12 is a detailed cross sectional view through said calender.

The invention is shown in Fig. 1 as used in connection with forming apparatus generally of the type set forth in my prior application on Method of and means for producing pipes of cementitious composition, Ser. No. 212,071, filed June 6, 1938, now Patent No. 2,200,267, granted May 14, 1940, of which this application is a continuation in part. This apparatus includes a frame structure comprising upright members 1, which are connected by longitudinal members 2 and cross members 3 and 4. Top guides 5 extend transversely between the longitudinal members 2 and are braced at their outer ends by triangular braces 6.

A semi-circular apron 7 is secured to the frame structure to form a trough into which material may fall and be reused during the molding process, which trough may be partially enclosed at its ends, if desired, to catch and hold water.

Mounted in pedestals 8 supported on the respective cross members 4 at opposite ends of the machine is a calender designated generally by the numeral 9 hereinafter described more in detail. Immediately above the calender 9 is a mandrel designated generally by the numeral 10, the opposite ends of which are mounted loosely for relative vertical movement in guides 11 formed in the pedestals 8.

Mounted on opposite sides of the mandrel 10 are calenders 12 and 13, each of which is mounted in slidable bearing blocks 14 upon guides 5, which bearing blocks are moved back and forth in straight line directions toward and from the mandrel 10 by fluid power devices 15, suitably controlled by the operator. The calenders 12 and 13 may be withdrawn for the removal of the mandrel 10 when filled and its replacement by an empty mandrel, such filling and replacement being accomplished by a hoist 16 and during the operation of the machine the fluid power devices 15 press the calenders 12 and 13 against the periphery of the mandrel 10 and the pipe which builds up thereon. The forming material is supplied to the peripheries of the calenders 12 and 13 as these are rotated in the directions indicated by the arrows in Fig. 1, and which calenders have the surfaces thereon moistened by atomizers 17

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acting thereon. Arranged above the respective calenders 12 and 13 are hoppers 18 in position to direct an asbestos cement mixture onto the moistened peripheries of the calenders. The hoppers 18 have wire brushes 19 operating therein for uniform distribution of the material along the calenders. The hoppers 18 are supplied with substantially dry mixture from superposed hoppers 20. One set of hoppers may be used for relatively thin pipe, but as the pipe increases in thickness superposed sets of feeding hoppers may be used, up to four sets to increase production.

The calenders 8, 12 and 13 are power driven in the directions indicated by the arrows and rotate in unison, while the mandrel 10 rides freely by gravity on the calender 9 between the latter and the calenders 12 and 13. As the cementitious material is fed downward onto the rotating moistened surfaces 12 and 13 the mixture supplied to the surface is sufficient to hold the material thereon until it reaches the bight between said calenders and the mandrel 10 when it is caused to adhere to the latter and be transferred thereto, forming a layer on the mandrel. The layer on the calender 12 turns through approximately 90° before coming into contact with the mandrel, while the layer on the calender 13 turns through approximately 270° before it is transferred to the mandrel, whereby the layers are built up in superposed relation until the desired thickness of pipe is reached, after which the calenders 12 and 13 may be withdrawn and the filled mandrel removed and replaced with an empty mandrel and the process repeated.

Since the calender 9 is fabric covered, it is washed by an atomizer 21 directed against the periphery of the calender, and thereafter thoroughly brushed by a brush 22 adjustably mounted at 23. The fabric of the calender 9 is then squeezed by a rubber wringer roll 24 adjustably spring-pressed at 25, so as to regulate the moisture remaining in the fabric of the calender whereby it may have just sufficient moisture to hydrate each semi-dry layer. The wringer roll 24 preferably is in multiple sections, relatively movable, to avoid tearing.

The apparatus above described may be used for the formation of straight pipes or pipes with bell collars at one or both ends, but in forming such bell collars, provision should be made for variations of speed between the cylindrical portions and the bell portions to obtain a uniform circumferential speed of movement at the bight between the mandrel and calenders, not only at the cylindrical portions but also at the bell portions thereof, so as to form the bell without injury. The bodies of the calenders are power driven and sleeves are provided on the bell portions for rotation free of the bodies for movement only by frictional engagement against the rotating mandrel which is rotated also by the bearing engagement with the rotating calenders. The detailed construction of the respective rolls is shown in Figs. 2 to 12.

Fig. 2 illustrates the structure of the calender 9 which has a body portion 28 provided with a reduced neck 29 and to which body portion and neck are secured journals 30 and 31, adapted for mounting in the pedestals 8. A fabric covering 32 is secured around the cylinder-forming portion of the calender body 28. The neck 29 of the body has a cylindrical and frusto-conical portion on which is mounted a bushing 33 loose for relative movement. Journaled on the bushing 33 is a conic ring 34 and a cylindrical sleeve 35 which are shown as provided with packings 36 at the opposite ends thereof. The sleeve 35 is covered by fabric 37. Instead of using the fabric coverings 32 and 37, the calender body and sleeve may be roughened, if desired. This leaves the conic ring 34 and the sleeve 35 free of the body portion 28 for relative turning movement, whereby the sleeve 35 coacts with the enlarged bell-forming portion of the mandrel 10 for frictional turning movement therebetween without relative motion.

The calender 13 is shown in Fig. 4 with its parts illustrated in Figs. 5 to 8. It is similar in construction to the calender 9 except that its body portion 40 has no fabric, and it is provided with flanges 41 and 42 at opposite ends to confine the cementitious material. The body portion 40 has a reduced neck portion 43 with a bushing 44 rotatably mounted thereon and around which is journaled a sleeve 45, free to rotate relative to the body portion and coacting with the bell-forming enlargement on the mandrel 10 to provide uniform circumferential speed of rotation at the bell forming portion.

Another form of calender is shown in Figs. 9 to 12 in which a body portion 48 has a reduced end portion 49 between which is a conic section 50. The reduced end 49 carries a sleeve 51, while the conic section 50 carries a frusto-conical ring 52 which ring and sleeve are mounted on ball bearings 53 for free journaling thereof relative to the body. The body portion and sleeve are covered with fabric indicated at 54 and 55, respectively, which are held in place by clamping blocks 56 and 57 secured to the body as shown in Figs. 9 and 12.

Calenders of these constructions may be used wherever it is desired to form bell collars on pipes in coaction with a mandrel and it will be clearly understood that such calenders are not restricted to use in the forming apparatus shown in Fig. 1, as they are equally adapted for use with a forming screen operating in a liquid suspension of cementitious material, or in other forms of pipe producing apparatus.

In forming bell collars at both ends of the pipe, it will be evident that the bell-forming enlargement will be provided at both ends of the mandrel, and coacting collar-forming sleeves will then be provided on both ends of each calender.

The invention is applicable also to the formation of tubes of other materials than cementitious mixtures, such as Bakelite, asphaltic-resin, gutta percha, or papier-mâché. For such materials, the calender rolls should be heated for best results.

By operating the mandrel between three calenders, triangular compression is obtained on the pipe which enables it to be completely finished in the forming machine, without the necessity for a separate finishing operation.

I claim:

1. In a pipe producing machine, the combination of a mandrel adapted to receive cementitious material thereon to form a pipe with a bell collar, of a calender roll coacting with said mandrel, said calender roll having a body portion adapted to bear against the mandrel, and having a peripheral portion movable relative to said body portion and adapted to shape the bell collar of the pipe, and a packing interposed between said movable peripheral portion and the body portion adjacent the periphery thereof to prevent adhesion by the entry of cementitious material therebetween.

2. In a machine for producing pipes from cementitious material, the combination of a mandrel adapted to receive material thereon to form

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a pipe and having a portion adapted to shape said material to form a bell collar on the pipe, and a calender coacting with said mandrel, said calender having a body portion bearing against the mandrel to shape the material thereon and having a sleeve movable relative to said body portion and coacting with the bell collar forming portion of the mandrel, and a packing interposed between an end of said sleeve and the body portion adjacent the periphery thereof to prevent adhesion by the entry of cementitious material therebetween.

3. In a machine for producing pipes from cementitious material, the combination of a mandrel adapted to receive material thereon to form a pipe and having an enlargement to form a bell collar on the pipe, and a calender for shaping the material on the mandrel, said calender having a body portion bearing against the pipe forming portion of the mandrel and rotatable in bearing engagement therewith, said body portion having a reduced end portion formed in one integral piece therewith and surrounded by a sleeve freely rotatable relative to the body portion and bearing against the enlargement on the mandrel for shaping the bell collar thereof, said sleeve being of uniform thickness from end to end thereof.

4. In a machine for producing pipes from cementitious material, a calender comprising a body portion having an end portion of different diameter than the body portion and surrounded by a sleeve journaled thereon for free movement relative to the body portion, and a packing interposed between said sleeve and the body portion adjacent the peripheries thereof to prevent the entry of cementitious material therebetween.

5. In a machine for producing pipes from cementitious material, a calender having a body portion with an end portion formed in one integral piece therewith and of reduced diameter relative to said body portion, and a sleeve surrounding said reduced end portion and freely rotatable relative to the body portion, said sleeve being of uniform thickness from end-to-end thereof.

6. In a machine for producing pipes from cementitious material, a calender comprising a cylindrical body portion having an integral reduced end portion of smaller diameter than the body portion, and a relatively thin-walled sleeve surrounding said reduced end portion and freely rotatable relative to the body portion, said sleeve being of uniform thickness from end-to-end thereof.

7. In a machine for producing pipes from cementitious material, a calender comprising a cylindrical body portion having a reduced end portion of smaller diameter than the body portion, a sleeve surrounding said reduced end portion and freely rotatable relative to the body portion, and means interposed between and journaling said sleeve on the reduced end portion and freely movable relative to both forming a bearing therefor.

8. In a machine for producing pipes from cementitious material, a calender comprising a cylindrical body portion having an integral reduced end portion of smaller diameter than the body portion, a sleeve surrounding said reduced end portion and freely rotatable relative to the body portion, and a conic section approximately of uniform thickness interposed in axial alignment between the sleeve and the body portion and rotatable relative to said body portion and sleeve.

9. In a machine for producing pipes from cementitious material, a calender roll comprising a body portion having an end portion of a different diameter than the body portion, a sleeve surrounding said body portion and journaled thereon for free movement relative thereto, a conic section interposed in axial alignment between the sleeve and the body portion and rotatable relative to both, and packings interposed between said conic section and the sleeve and body portion respectively adjacent the peripheries thereof substantially to prevent the entry of cementitious material therebetween.

10. In a machine for producing pipes from cementitious material, a calender comprising a cylindrical body portion having an integral cylindrival reduced end portion of smaller diameter than the body portion, said body portion and reduced end portion having the respective outer ends thereof open, a sleeve surrounding said reduced end portion and freely rotatable relative to the body portion, a conic section interposed between the sleeve and the body portion and rotatable relative to said body portion, and journals fixed in the open opposite ends of the calender and rigid therewith for mounting the said body portion for turning movement.

11. In a machine for producing pipes, a calender comprising a cylindrical body portion having a reduced end portion, a sleeve surrounding said reduced end portion and journaled thereon, journals for said body portion, and a flange adjustably mounted on one of said journals for axial movement and having bearing engagement with the sleeve to adjust said sleeve axially.

12. In a machine for producing pipes, a calender comprising a cylindrical body portion having a reduced end portion, a sleeve surrounding said reduced end portion and journaled thereon, a packing ring interposed between adjacent ends of the sleeve and body portion adjacent the periphery thereon to prevent the entry of cementitious material therebetween, said sleeve being axially movable on the reduced end portion toward the packing ring to take up for wear, and means for securing said sleeve in adjusted position.

13. In a machine for producing pipes, a calender comprising a cylindrical body portion having a reduced end portion, a sleeve surrounding said reduced end portion and journaled thereon, a packing ring interposed between adjacent ends of the sleeve and body portion adjacent the periphery thereof to prevent the entry of cementitious material therebetween, said sleeve being axially movable on the reduced end portion toward the packing ring to take up for wear, journals for the calender, a flange slidably mounted on one of the journals in abutting relation with the sleeve for holding the same against the adjacent end of the the body portion, and means for securing said flange in adjusted position on said journal.

14. In a pipe producing machine, the combination of a calender roll adapted to bear against a mandrel having a layer of cementitious material thereon, said calender roll having a solid peripheral surface with a fibrous covering surrounding said solid surface externally thereof, a wringer roll in peripheral bearing engagement with the calender roll, said wringer roll having a resilient peripheral portion, means mounting said wringer roll for bodily movement, and means for resiliently pressing the wringer roll against the calender roll.

15. In an apparatus for producing pipe, the combination of a calender roll mounted for rotary

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movement about an approximately horizontal axis in position to receive a mandrel thereon, and a pair of calender rolls mounted for rotary movement about axes approximately parallel with the first-mentioned axis and on opposite sides thereof in position to bear against said mandrel.

16. In an apparatus for producing pipe, the combination of a calender roll mounted for rotary movement about an approximately horizontal axis in position to receive a mandrel thereon, and a pair of calender rolls mounted for rotary movement about axes approximately parallel with the first-mentioned axis and on opposite sides thereof above said first-mentioned axis in position to bear against opposite sides of said mandrel approximately in alignment with the axis thereof.

17. In an apparatus for producing pipe, the combination of a calender roll mounted for rotary movement about an approximately horizontal axis in position to receive a mandrel thereon, a pair of calender rolls mounted for rotary movement about axes approximately parallel with the first-mentioned axis and on opposite sides thereof above said first-mentioned axis in position to bear against opposite sides of said mandrel approximately in alignment with the axis thereof, and means for applying pressure in opposed directions against the pair of calender rolls.

18. In an apparatus for producing pipe, the combination of a rotatable mandrel adapted to receive one or more layers of moldable material thereon, a pair of rotatable calender rolls mounted on opposite sides of said mandrel in peripheral bearing relation against opposite sides thereof, and a third rotatable calender roll intermediate said pair of calender rolls and in peripheral bearing relation with the mandrel.

19. In an apparatus for producing pipe, the combination of a calender roll mounted for rotary movement about an approximately horizontal axis in position to receive a mandrel thereon, a pair of calender rolls mounted for rotary movement about axes approximately parallel with the first-mentioned axis and on opposite sides thereof above said first-mentioned axis in position to bear against opposite sides of said mandrel approximately in alignment with the axis thereof, and means for applying a layer of cementitious material to the peripheral surface of one of said pair of calender rolls in position for transfer therefrom onto the mandrel, the first-mentioned calender roll being arranged to apply calendering action to the applied layers on the mandrel.

20. In an apparatus for producing pipe, the combination of a rotatable mandrel adapted to receive one or more layers of moldable material thereon, a pair of rotatable calender rolls mounted on opposite sides of said mandrel in peripheral bearing relation against opposite sides thereof, a third rotatable calender roll intermediate said pair of calender rolls and in peripheral bearing relation with the mandrel, each of said rolls extending substantially throughout the length of the mandrel, and means for applying a layer of cementitious material to the peripheral surface of one of said pair of calender rolls approximately throughout the length thereof and transferring the same onto the mandrel, the third calender roll applying calendering action to the applied layers on the mandrel.

21. In an apparatus for producing pipe, the combination of a calender roll mounted for rotary movement about an approximately horizontal axis in position to receive a mandrel thereon, and a pair of calender rolls mounted for rotary movement about axes approximately parallel with the first-mentioned axis and on opposite sides thereof above said first-mentioned axis in position to bear against opposite sides of said mandrel approximately in alignment with the axis thereof, said pair of calender rolls having smooth peripheral surfaces, and the first-mentioned calender roll having a fibrous peripheral surface.

22. In an apparatus for producing pipe, the combination of a calender roll mounted for rotary movement about an approximately horizontal axis in position to receive a mandrel thereon, a pair of calender rolls mounted for rotary movement about axes approximately parallel with the first-mentioned axis and on opposite sides thereof above said first-mentioned axis in position to bear against opposite sides of said mandrel approximately in alignment with the axis thereof, and mounting means for the first-mentioned calender roll holding the axis thereof stationary continuously during the action on the pipe.

23. In an apparatus for producing pipe, the combination of a calender roll mounted for rotary movement about an approximately horizontal axis in position to receive a mandrel thereon, a pair of calender rolls mounted for rotary movement about axes approximately parallel with the first-mentioned axis and on opposite sides thereof above said first-mentioned axis in position to bear against opposite sides of said mandrel approximately in alignment with the axis thereof, mounting means for the first-mentioned calender roll holding the axis thereof stationary continuously during the action on the pipe, and mounting means for the pair of calender rolls for moving the same in opposite directions away from the mandrel during the action on the pipe.

24. In a pipe producing machine, a calender roll adapted to bear against a mandrel having a layer of cementitious material thereon, said calender roll having a solid peripheral surface with a fibrous covering thereover, means for applying moisture to the fibrous covering on the calender roll, and a wringer roll in peripheral bearing relation with the calender roll.

25. In an apparatus for producing pipe, the combination of a calender roll mounted for rotary movement about an approximately horizontal axis in position to receive a mandrel thereon, a pair of calender rolls mounted for rotary movement about axes approximately parallel with the first-mentioned axis and on opposite sides thereof above said first-mentioned axis in position to bear against opposite sides of said mandrel approximately in alignment with the axis thereof, said pair of calender rolls having smooth peripheral surfaces, the first-mentioned calender roll having a fibrous peripheral surface, and means for applying moisture to the fibrous covering on the first-mentioned calender roll to prevent adherence of the formed layers thereto.

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