July 23, 1946. E. F. SEWELL 2,404,464

PIPE FORMING MACHINE

Filed April 17, 1944 2 Sheets-Sheet 1

Fig. 1

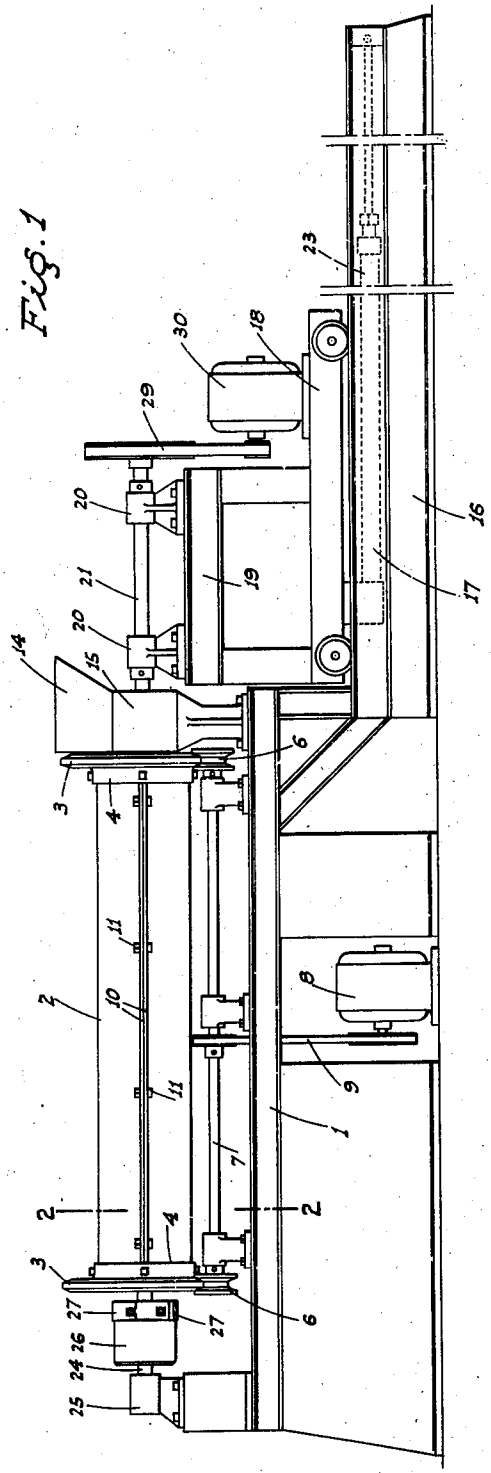


Fig. 3

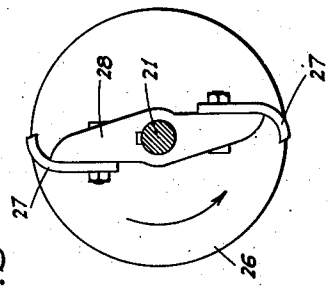
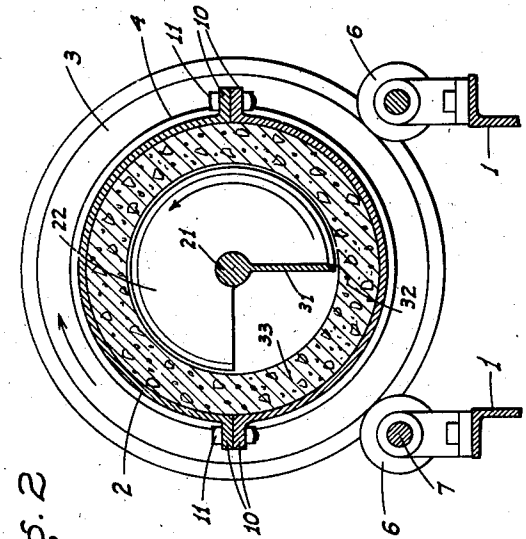


Fig. 2



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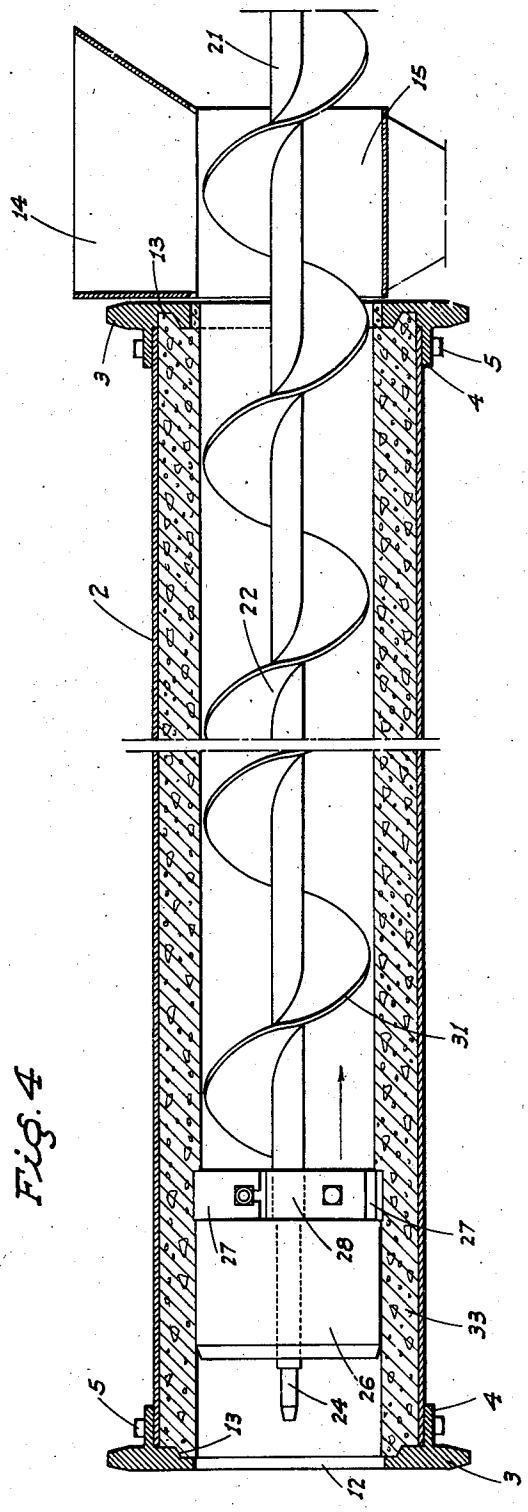


Fig. 4

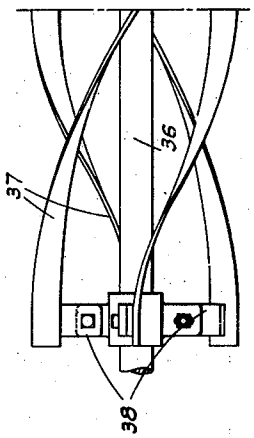


Fig. 6

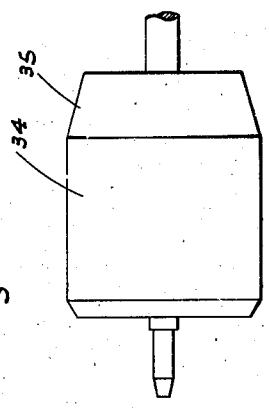


Fig. 5

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UNITED STATES PATENT OFFICE

2,404,464

PIPE FORMING MACHINE

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13 Claims. (Cl. 25—36)

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This invention relates to, and it is an object to provide, an improved machine for the manufacture of concrete pipe.

Another object of this invention is to provide a concrete pipe forming machine which is capable of producing concrete pipe rapidly, effectively, in relatively long sections, and of relatively small diameter or bore, as well as in standard length sections and bores.

A further object of this invention is to provide a concrete pipe forming machine which will pack and form concrete having the proper water-cement ratio to produce a mix having zero slump, and from which mix pipe of maximum strength can be obtained.

An additional object of the invention is to provide a concrete pipe forming machine, including a horizontally rotated cylindrical mold, which is operative to pack the mix to the desired form, while maintaining the uniformity of such mix, i. e. separation or stratification of the aggregate, as well as leaching of the cement from the outside of the pipe wall, is avoided.

It is also an object of the present invention to provide a concrete pipe forming machine which comprises, in combination, a horizontal power rotated mold of cylindrical configuration, said mold being open at opposite ends, and a power driven auger conveyor and packer initially extending centrally through said mold from end to end thereof and in clearance relation to its circumferential wall. The auger conveyor is operative to progressively feed the mix into the mold from end to end thereof to initially form the pipe and is then movable axially out of the mold; there being a packing and finishing head mounted in unitary connection with one end of the auger conveyor and functioning, when the auger conveyor is withdrawn from the mold, to further pack the mix and finish the inside of the pipe to correct diameter.

A further object of the invention is to produce a simple and inexpensive device, and yet one which will be exceedingly effective for the purpose for which it is designed.

These objects I accomplish by means of such structure and relative arrangement of parts as will fully appear by a perusal of the following specification and claims.

In the drawings similar characters of reference indicate corresponding parts in the several views:

Figure 1 is a side elevation of the machine, partially foreshortened.

Figure 2 is an enlarged transverse section on line 2—2 of Fig. 1.

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Figure 3 is an end view, enlarged, of one form of the packing and finishing head.

Figure 4 is an enlarged fragmentary sectional elevation, foreshortened, illustrating the auger conveyor and packer being withdrawn from the mold after initial formation of the pipe section, and showing the packing and finishing head in operation.

Figure 5 is an enlarged elevation of a modified form of packing and finishing head, detached.

Figure 6 is an enlarged fragmentary elevation of a modified conveyor and packer, detached.

Referring now more particularly to the characters of reference on the drawings, the machine comprises a rigid base 1 disposed horizontally and supported above the floor. An axially elongated cylindrical mold or shell 2 is disposed horizontally above the bed 1 and includes annular heads 3 removably attached thereto by flanges 4 and securing bolts 5. The annular heads 3 extend radially out some distance beyond the mold 2 and are supported by transversely spaced V-groove rollers 6 disposed at each end of and below the mold. Corresponding ones of said rollers at opposite ends of the mold are mounted on a countershaft 7 which is driven from a motor 8 by means of an endless belt 9. It will be seen that the rollers 6 form the support, as well as the drive, for the mold 2, the latter being readily removable from the rollers to permit different molds to be successively used in the machine.

The mold 2 is formed of a pair of longitudinal half sections, as clearly shown in Fig. 2, and said sections, at adjacent edges, are formed with outwardly projecting matching flanges 10 detachably connected together by bolts 11.

The center openings 12 in the annular heads 3 are of substantially the same diameter as the inside diameter of the pipe section to be formed in the mold 2, and the inner faces of the heads 3 are shaped, as shown at 13, to form the tongue and groove at opposite ends of the pipe section.

A hopper 14 is mounted on the base 1 beyond one end of the mold 2 and such hopper includes an open-ended body 15 with one of said open ends in close register with the opening 12 in the adjacent mold head 3.

Beyond the hopper 14, in a direction lengthwise of the machine, the latter includes another bed 16 disposed horizontally but in a lower plane than the bed 1; such bed 16 including rails 17 on which a roller carriage 18 is movably supported. The carriage 18 is formed with an elevated platform 19 on which is mounted a pair of longitudinally spaced but alined bearings 20. A shaft 21 is jour-

naled, in axially immovable relation, in bearings 20. The shaft 21 is formed as an integral part of a relatively long auger conveyer 22, which initially extends through the hopper body 15 and mold 2 from end to end of the latter. The carriage 18 is normally advanced, as shown in Fig. 1; advancing and retracting movement of said carriage being accomplished through the medium of suitable power means, such as a fluid pressure actuated power cylinder 23 connected between the carriage and one end of the bed 16. At the end opposite the hopper body 15 the auger conveyer 22 includes a projecting shaft 24 adapted to removably engage in an end bearing 25 mounted in fixed position in connection with the bed 1. When the carriage 18 is in its advanced position, the shaft 24 is engaged in said bearing 25, whereby bearings 20 and 25 then support the auger conveyor 22 at opposite ends and maintain said auger against undesirable lateral deflection when in operation.

A cylindrical packing and finishing head 26 is fixed on the shaft 24 between its outer end and the adjacent end of the auger conveyor 22; such packing and finishing head being disposed outside of the mold 2 when the carriage 18 is advanced and the auger 22 extends through the mold from end to end thereof. The packing and finishing head 26 includes, at its lead end, a plurality of substantially radially extending finishing blades or troweler shoes 27 adjustably secured to a mounting member 28 at one end of said head 26. The finishing blades 27 are curved at their outer ends opposite the direction of rotation, and extend slightly outwardly of the periphery of head 26.

The unit, comprising the shaft 21, together with the auger 22, shaft 24, and packing and finishing head 26, is driven by means of an endless belt and pulley assembly 29 from an electric motor 30 mounted on and movable with the carriage 18.

Operation

In operation, the carriage is fully advanced to project the auger conveyor 22 through the mold 2 and until the shaft 24 seats in bearing 25. Thereafter the motors 8 and 30 are started, such motors driving the mold 2 and auger conveyor 22 in opposite directions; the speed of both the mold 2 and auger conveyor 22 being relatively slow. For example, the peripheral speed of the mold does not need to exceed 425 linear feet per minute.

With the mold 2 and auger conveyor 22 rotating in opposite directions, the concrete mix is fed into the hopper 14 and is at once picked up from the hopper body 15 by the auger conveyor 22 and carried into the mold 2. The auger conveyor then functions to progressively distribute the mix in said mold from the end adjacent the hopper to the opposite end, and during the period of such distribution of the mix, it is also initially packed in the mold by the spiral vane 31 of the conveyor 22.

In order to facilitate this packing action the outer or working edge of vane 31 may be beveled, as at 32, with the bevel facing in the direction of rotation. This beveled edge of the vane 31 urges the mix into the pipe wall being formed, and consequently increases the density of such wall. The density of the pack can be controlled by the angle of the bevel 32. It should also be noted that due to the relatively slow speed of the mold 2, stratification of the aggregates in the mix does not occur, nor is there any leaching of the cement from the outside of said pipe wall.

The mix continues to be fed into the hopper 14 until the annular space between the auger conveyor and said mold is filled from end to end of the latter, as shown in Fig. 4.

When this occurs the feeding of the mix is stopped, and thereafter, with the mold and auger conveyor 22 still being rotated in opposite directions, the carriage 18 is slowly retracted, which draws the auger conveyor 22 slowly out of the mold 2. With such retraction of the auger conveyor 22 the packing and finishing head 26 is drawn through the mold from end to end thereof, producing a further packing, and an inside finishing, of the pipe section 33, which has been previously formed in the mold by said auger conveyor. If any end slippage should occur during retraction of the conveyor 22 and movement of the packing and finishing head 26 through the pipe section 33, which end slippage would cause laterally inward shattering of the pipe wall, the conveyor 22 would immediately pick up such shattered concrete and feed it directly back to the packing and finishing head. As a result pipe sections are formed without imperfection.

When the auger conveyor 22 and packing and finishing head 26 are completely withdrawn from the mold 2, the latter is removed from the machine and transported to the curing room; a separate and empty mold then being replaced on the machine for use in connection with the formation of a further pipe section.

In Fig. 5 there is illustrated a modified type of packing and finishing head which comprises a cylindrical body 34 whose leading end portion is tapered inwardly, as at 35; this embodiment of the packing and finishing head employing no finishing shoes, as in the type shown in Fig. 3. This form of packing and finishing head may be used when the consistency of the mix does not require the use of a head having finishing blades.

In Fig. 6, there is illustrated a modified type of conveyor which comprises, with a center shaft 36, a plurality of longitudinally extending, symmetrically disposed spiral blades 37 which are relatively narrow transversely. Said blades 37 are supported from the shaft 36 by adjustable spider arms 38; the adjustment of said arms being employed for the purpose of adjusting the blades 37 to compensate for wear.

From the foregoing description it will be readily seen that I have produced such a device as substantially fulfills the objects of the invention as set forth herein.

While this specification sets forth in detail the present and preferred construction of the device, still in practice such deviations from such detail may be resorted to as do not form a departure from the spirit of the invention, as defined by the appended claims.

Having thus described my invention, what I claim as new and useful and desire to secure by Letters Patent is:

1. A concrete pipe forming machine comprising a horizontal base, a cylindrical horizontally disposed mold above the base, means on the base removably supporting the mold for rotation, a hopper mounted on the base at one end of the mold, the hopper including a body open at opposite ends and one end closely registering with the adjacent open end of the mold, a carriage mounted on the base beyond the hopper for movement parallel to the mold axis, an elongated auger conveyor journaled at an end on the carriage in axial alinement with said open ended hopper body and the mold, said auger conveyor extend-

ing through said body and from end to end of the mold when the carriage is advanced, and means to drive the conveyor and mold in opposite directions.

2. A concrete pipe forming machine comprising a horizontal base, a cylindrical horizontally disposed mold above the base, means on the base removably supporting the mold for rotation, a hopper mounted on the base at one end of the mold, the hopper including a body open at opposite ends and one end closely registering with the adjacent open end of the mold, a carriage mounted on the base beyond the hopper for movement parallel to the mold axis, an elongated auger conveyor journaled at an end on the carriage in axial alinement with said open ended hopper body and the mold, said auger conveyor extending through said body and from end to end of the mold when the carriage is advanced, and means to drive the conveyor and mold in opposite directions; the auger conveyor being of lesser diameter than the mold, and the latter including annular end heads having a central opening of a diameter only slightly larger than the conveyor.

3. A concrete pipe forming machine comprising a horizontal base, a cylindrical horizontally disposed mold above the base, means on the base removably supporting the mold for rotation, a hopper mounted on the base at one end of the mold, the hopper including a body open at opposite ends and one end closely registering with the adjacent open end of the mold, a carriage mounted on the base beyond the hopper for movement parallel to the mold axis, an elongated auger conveyor journaled at an end on the carriage in axial alinement with said open ended hopper body and the mold, said auger conveyor extending through said body and from end to end of the mold when the carriage is advanced, and means to drive the conveyor and mold in opposite directions; the conveyor including an axial shaft projecting freely from the end opposite the carriage, and a bearing mounted in connection with the base a distance beyond the end of the mold opposite the hopper, said shaft being outside the drum and removably seating in said bearing when the carriage is advanced.

4. A concrete pipe forming machine as in claim 3 including a finishing and packing head mounted on said shaft, and said head being outside the mold when the carriage is advanced.

5. A concrete pipe forming machine comprising an open ended mold, a feed hopper disposed adjacent one end of the mold and having its discharge opening in register with said end of the mold, an auger conveyor projecting through the feed hopper and through the length of the mold the longitudinal axis of the conveyor being in substantial alinement with the longitudinal axis of the mold, the edges of the convolutions of the auger conveyor being equally spaced from the side walls of the mold for the full circumference thereof, and the space between the peripheral edges of such convolutions and the walls of the hopper being freely open whereby material conveyed by the conveyor from the hopper will be progressively and uniformly packed along the length of the mold between the outer periphery of the conveyor convolutions and the side walls of the mold by the action of the conveyor, whereby to form the pipe and means to rotate the conveyor.

6. A device as in claim 5 in which the outer periphery of the convolutions of the auger is beveled to engage and compact and smooth the concrete as it is packed into the mold.

7. A device as in claim 5 including in combination therewith, means to withdraw the conveyor from the mold while continuing its rotation.

8. A device as in claim 5 including in combination therewith, means to withdraw the conveyor from the mold and means distinct from the conveyor but attached thereto to pack and finish the interior wall of the formed pipe as the conveyor is being withdrawn from the mold.

9. A device as in claim 5 including in combination therewith, means to withdraw the conveyor from the mold, and a packing and finishing head on the outer end of the conveyor functioning upon withdrawal of the latter to pack and finish the interior wall of the formed pipe.

10. A concrete pipe forming machine comprising an open ended mold, an open ended feed hopper fixed adjacent the mold with one open end in register with an open end of the mold, a carriage movable relative to the feed hopper and mold, and an auger conveyor journal mounted on the carriage and adapted to be projected through the hopper and the length of the mold with movement of the carriage in one direction and to be retracted from the mold upon movement of the carriage in the opposite direction, and means to rotate the conveyor.

11. A concrete pipe forming machine comprising an open ended mold, an open ended feed hopper disposed adjacent the mold with one open end of the hopper in register with one open end of the mold, a carriage movable toward and away from the feed hopper, a shaft journaled on the carriage and adapted to be moved longitudinally through the hopper and mold and to the full length of the mold, means to rotate the shaft, an auger disposed conveyor along the length of the shaft and which may be selectively projected through the hopper and mold or withdrawn therefrom.

12. A device as in claim 11 and in combination therewith a fixed journal adjacent the mold at the end opposite the end at which the hopper is disposed, the outer end of the shaft being adapted to move into and be supported by such bearing when the shaft has been advanced beyond the adjacent end of the mold.

13. A concrete pipe forming machine comprising an open ended mold, means to revolve the mold, an auger conveyor having its longitudinal axis in substantial alinement with the longitudinal axis of the mold, means to revolve the conveyor, means to selectively move the conveyor into and out of the mold while continuing its revolution, the peripheral edge of the convolutions of the auger conveyor being uniformly spaced from the inner wall of the mold and the space between such edge and wall being freely open, means to feed material to the conveyor when it is within the mold, the relative motions of the mold and conveyor then causing the material to be conveyed into the mold and packed into said space, a packing head on the end of the conveyor and beyond the convolutions of the auger, the diameter of said head being slightly greater than the diameter of the said convolutions whereby upon withdrawal of the auger from said mold such head will further compact and smooth the interior of said material in said place.

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