May 5, 1942. O. TUERCK 2,281,731

END FORMER FOR CONCRETE PIPE

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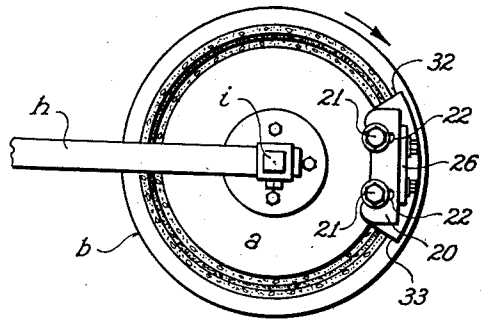


Fig. 2

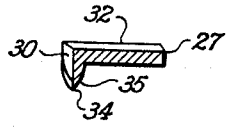


Fig. 7

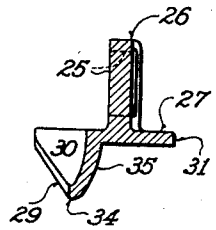


Fig. 8

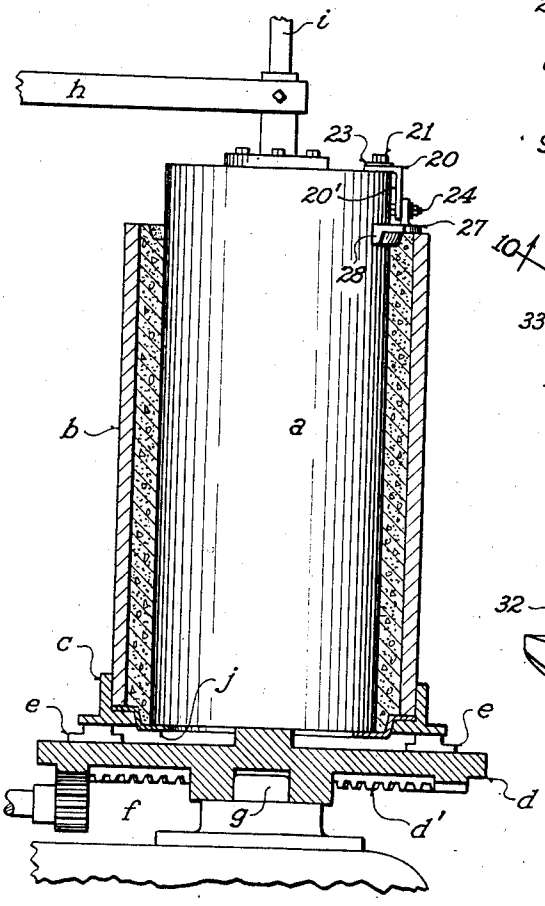


Fig. 1

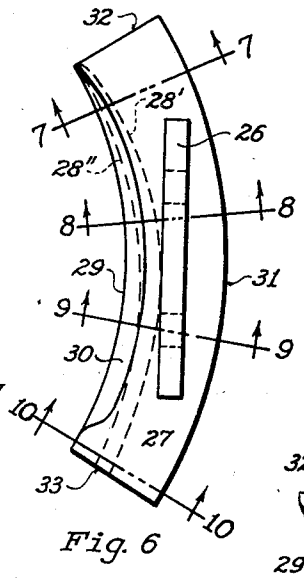


Fig. 6

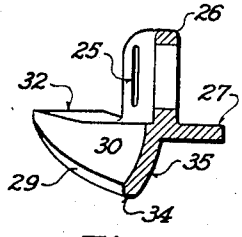


Fig. 9

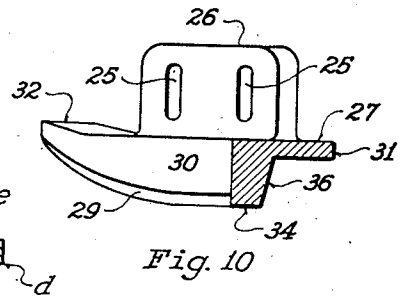


Fig. 10

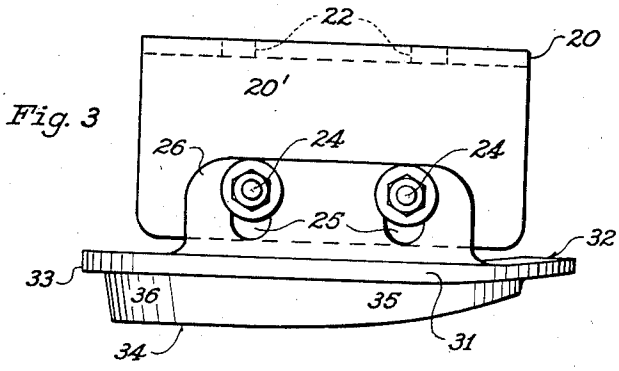
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Fig. 3



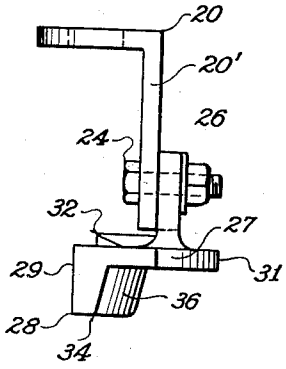


Fig. 4

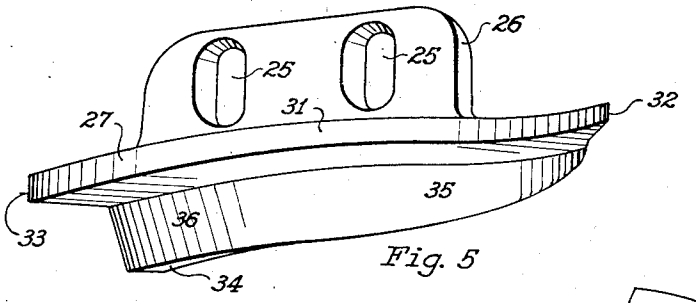


Fig. 5

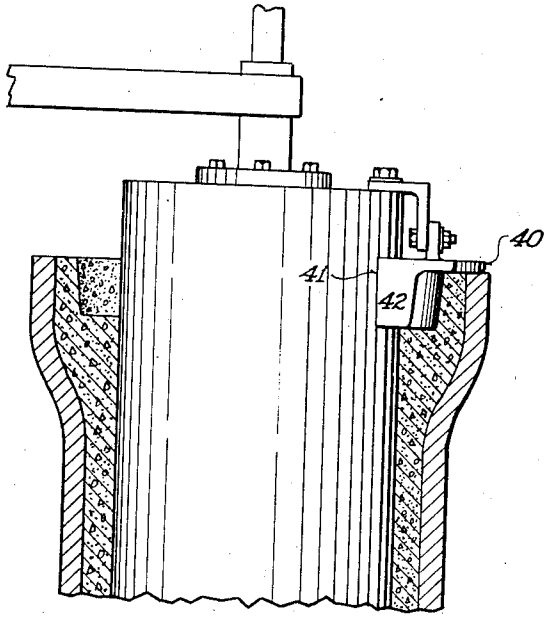
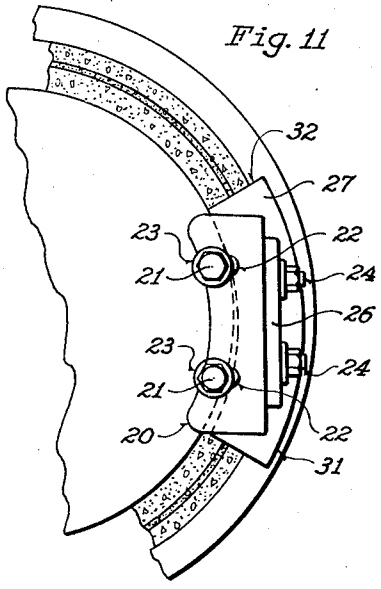


Fig. 12

Fig. 11



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END FORMER FOR CONCRETE PIPE

Oscar Tuerck, Portland, Oreg., assignor to Tuerck-Mackenzie Company, Portland, Oreg., a corporation of Oregon

Application September 3, 1940, Serial No. 355,214

6 Claims. (Cl. 25—39)

This invention relates to molds and machines for forming concrete pipe, and, more specifically, to means for forming tongue-and-groove end concrete pipe or for forming the female or "bell" end of concrete pipe.

Conventional concrete pipe machines include a central stationary cylindrical inner member or core and a rotatable outer mold spaced from the cylindrical surface of the core. The concrete mixture is gradually fed into the annular space between the rotating outer mold or shell and the core, while reciprocating tamping bars compact the plastic concrete mixture. In making bell end concrete pipe the mold is outwardly flared at the top in order to form the desired outer surface of the bell end.

In such conventional concrete pipe machines when the poured-in concrete mixture has reached the height at which the forming of the end of the pipe is to begin, the machine is temporarily stopped, the tamping bars are removed or withdrawn, and a ring or annular forming element for the inside of the end of the pipe is attached to the core. The mold is then caused to rotate again and further concrete is poured in to form the pipe end.

One of the objectionable features in this common method of forming the end is the fact that it is necessary to stop the machine entirely, when the end is to be formed, in order to attach the former to the top of the core. Also it is necessary to provide an annular member of exactly the right shape and diameter for the end of the particular pipe being formed. Another objection is the fact that the withdrawal of the tamping bars, prior to the setting of the end former in place, prevents further proper tamping of the concrete from this point on, with the result that this part of the pipe is weaker than the rest, the finished pipe, consequently, being more susceptible to breakage at this point. The ordinary annular end former, furthermore, is apt to leave the bell end of the pipe rough, and this is particularly true when a high percentage of rock is contained in the concrete mixture, a relatively large amount of rock in the concrete mixture requiring more tamping or the keeping of the mixture during the forming of the pipe under greater pressure in order to prevent the resulting surfaces of the pipe from being too rough. Thus, for these and other reasons, the forming of the pipe end with the usual ring former has not been found to be entirely satisfactory.

The object of this invention is to provide an improved end former for concrete pipe which will overcome all these objections. This object I accomplish by substituting a shoe-type end former in place of the common annular former, thereby enabling the former to remain on the core during the entire molding of the pipe, and dispensing with the necessity of stopping the machine or withdrawing the tampers prior to forming the end; by adjustably mounting the shoe former on the core; and by making the shoe or former of a particular shape and design as hereinafter described with reference to the accompanying drawings.

In the drawings:

Figure 1 is a vertical section of a mold for tongue-and-groove end concrete pipe, showing also the core for the mold and my improved end former attached thereto;

Figure 2 is a plan view corresponding to Figure 1;

Figure 3 is a side elevation, drawn to a larger scale, of the end-forming attachment removed from the core, and showing the bracket to which the forming shoe is directly attached;

Figure 4 is an end elevation corresponding to Figure 3;

Figure 5 is a perspective view of the forming shoe alone;

Figure 6 is a plan view of the forming shoe;

Figures 7, 8, 9 and 10 are cross-sections of the forming shoe taken progressively along the shoe on the lines 7—7, 8—8, 9—9 and 10—10 respectively of Figure 6;

Figure 11 is an enlarged fragmentary plan view showing the end-forming attachment at a slightly different position than in Figures 1 and 2; and

Figure 12 is a fragmentary vertical section of a mold for bell-end concrete pipe showing also a modified form of my improved forming shoe.

The mold for the tongue-and-groove concrete pipe shown partly in vertical section in Figure 1 comprises the usual stationary core *a* and the revolvable outer shell *b*. This outer shell of the mold is supported concentrically with the core *a* on a flanged base ring *c* which is carried on the circular platform *d* and is detachably secured thereto by a plurality of clamping blocks *e*. The platform *d* is provided with a series of teeth *d'* which are engaged by a pinion *f* driven by suitable means for rotating the outer shell *b* about the stationary core *a*. A central trunnion *g* formed on the revolvable platform *d*, extends with a sliding fit into the bottom of the core

and thus holds the base of the core concentric with the outer shell *b*, while the top of the core is likewise positioned by a bar *h* made fast to the flanged hoisting stem *i* of the core and to the frame of the machine.

The male or tongue or bottom end of the concrete pipe is formed as the plastic cementitious mixture is fed into the mold by a dished metal pan *j* at the bottom of the mold. The annular flange of the pan *j* is interposed between the base of the shell *b* of the mold and the supporting base ring *c* at the initial stage of operation and is removed with the completed pipe.

The formation of the receiving or grooved end of the pipe is accomplished in my invention by an improved forming shoe which is adjustably secured to the upper end of the stationary core by means of an angular bracket **20**. The bracket **20** is detachably mounted on the core by means of cap screws **21**, **21**, which are passed through open-end slots **22**, **22** provided in the shorter or horizontal leg of the bracket **20**, and these screws **21**, **21** are secured in holes threaded into the top of the core, washers **23**, **23** being interposed between the heads of the screws and the horizontal leg of the bracket **20**. The slots **22**, **22** make it possible to vary the position of the bracket **20**, and consequently of the attached forming shoe, with respect to the core, and the open ends of the slot permit the attaching or removal of the bracket by merely loosening the screws. The importance of providing for the adjustment of the angular bracket with respect to the core will be apparent later on in this description.

The forming shoe is adjustably-mounted on the bracket **20** by bolts **24**, **24** (see Figures 3 and 4) which extend through vertically elongated apertures **25**, **25** provided in the upstanding lug **26** of the shoe and extending through holes in the vertical leg **20'** of the bracket **20**. The forming shoe is an angular member having a horizontal flange **27** (see Figure 4) which is segmental in plan and having a vertical flange **28** correspondingly curved but of varying cross-sectional form. The curvature of the inside face **29** of the shoe is made to coincide in general with the curvature of the cylindrical core with which it is to be used, but the vertical flange **28** is preferably recessed substantially as shown at **30** in Figures 6 to 10. so as to reduce the amount of material required for making the shoe and, particularly, to reduce the expense of machining this bearing surface. The horizontal flange **27** of the shoe is made sufficiently wide to permit the radially curved edge **31** to overlap the edge of the shell *b* as shown in Figures 1 and 2.

The flange **27** of the shoe is made flat for the major part of its length but is preferably curved upwardly at the forward end **32** slightly as shown in Figures 3, 5, 9 and 10 to facilitate the passage of the rotating concrete mixture in the mold beneath the shoe and to cause the shoe to exert a compressing force on the top of the concrete mixture. The arcuate length of the shoe may vary from that enclosed by an angle of 100°, for the smaller sizes of pipe, to that of an angle of 30° for the larger sizes of pipe. The configuration of the vertical flange **28** of the shoe is of special importance in my invention. This flange increases uniformly in thickness from the forward end **32** of the shoe towards the rear end **33** of the shoe, as shown in the progressive cross-sectional views, Figures 7, 8, 9 and 10, and is indicated by the broken lines **28'** and **28''** of Figure 6 which correspond to the top and bottom edges of the outside surface of this downwardly-extending vertical flange. In the shoe illustrated in the drawings, the average transverse thickness of this vertical downwardly-extending flange, based on the average maximum thickness, is approximately 20% at the forward end **32**, 25% on the plane of line **7**—**7** as shown in Figure 7, 50% on line **8**—**8** as in Figure 8, 75% on line **9**—**9** in Figure 9, and 100% on line **10**—**10** as in Figure 10. The final thickness from the plane corresponding to line **10**—**10** to the rear end of the shoe conforms to the required radial depth of the desired groove in the finished pipe. Variations in these progressive degrees of thickness of the vertical flange might be made but the proportions suggested I have found to be quite satisfactory. This curved wedge formation of the vertical downwardly-extending flange is augmented by varying the depth of the flange and the variations in depth, as shown in the sectional views of Figures 7 to 10, and also shown in the side elevation, Figure 3, are obtained by shaping the bottom edge **34** in a curve that commences closely beneath the horizontal flange at the forward end **32** of the shoe and gradually descends until at a point approximately two-thirds of the distance from the forward end of the shoe to the rear, it reaches the full depth of the flange and then continues at this depth for the remainder of the distance forming a bottom edge parallel to the horizontal flange. In conformity with the varying thickness and depth of this vertical flange, as described, the outer or actual forming surface **35** of the flange is convexly curved in the manner shown in Figures 7, 8 and 9, so as to provide a smooth transition from the comparatively thin and shallow section at the forward end of the shoe to the desired width and depth illustrated in Figure 10. At this latter point the convexity has decreased to nil in the flat beveled face **36**.

From the above description of the shape of my forming shoe, it will be apparent that this shoe is designed to afford the least possible resistance to the motion of the mass of cementitious material which is accumulated and revolved in the mold about the stationary core and beneath the shoe, while the shoe, adjustably secured to the core, performs its function of forming the required groove in the end of the pipe. The upturned forward end of the horizontal flange of the shoe and the minimum thickness and depth of the vertical flange of the shoe contribute to facilitate the entrance of the shoe into this plastic mass. A very important result obtained because of the design and shape of this shoe resides in the fact that immediately the cementitious mixture enters the space between the shoe and rotating outer shell of the mold, the increasing thickness and depth of the vertical flange of the shoe cause a compressive force to be exerted gradually to densify and compact the mixture and eliminate the air voids that would otherwise result in weakness in the pipe. The annular pipe rim surrounding the groove and the portion of the pipe beneath the groove are thus compacted into a homogeneous section which is equal to or even superior in comparative strength to the rest of the pipe, leaving this end of the pipe finally with a comparatively smooth trowelled surface. The downward compressive force exerted by the horizontal flange of the shoe, in conjunction with the trowelling action thereof, may readily be varied by the adjustment provided through the bolts **24**, **24** and

the slots 25, 25 in the lug 26 of the shoe, whereby the shoe may be inclined in either direction or raised or lowered bodily with respect to the supporting bracket 20 and the running clearance between the fixed shoe and the top edge of the rotating shell *b* may also be varied to compensate for wear on the effective face of this horizintal flange.

The open-ended slots 22, 22, in combination with the cap screws 21, 21, by which the horizontal leg of the bracket is secured, afford similar adjustment in a lateral direction and permit a shoe, attached to the bracket, to be moved away from the core, in the manner illustrated in Figure 11, in order to vary the radial depth of the groove in the finished pipe and also to compensate for wear on the outer face of the vertical flange of the shoe.

Thus, through my invention, I provide a forming shoe which, by virtue primarily of its segmental form, as opposed to the annular form of formers in common use, may be readily attached to the core, adjusted or removed, without disturbing other parts of the assembly, and which shoe covers but a small portion of the annular space between the core and the rotating shell. As a result of having a shoe covering only a relatively small segmental portion of this annular space, the usual interruption in the operation of the machine in order to permit the forming ring for the end of the pipe to be installed is eliminated, and ample space is available for the operation of as many tamping bars as desired.

In Figure 12 I show a slightly modified form of my improved shoe, which modified form is used in shaping the groove of bell-end pipe. This shoe is similar to that above described except that the horizontal flange 40 is preferably made wider and the vertical flange 41 is made thicker and deeper at the rearward end 42 in order to form the larger groove which is required in the bell-end type of pipe.

It would of course be possible to make modifications in the exact size and shape of different parts of my former without departing from the principle of my invention, and it is not my desire to restrict my pipe-end former to the exact comparative dimensions indicated in this description, such dimensions being given by way of illustration only; and it is not my intention otherwise to limit my invention except as set forth in the appended claims.

I claim:

1. In an end former for shaping the groove end of a concrete pipe in a pipe machine having a cylindrical core, an angular bracket, said bracket having a pair of legs, one horizontal and one vertical, said horizontal leg attached to the top of said core, a shoe adjustably attached to the vertical leg of said bracket, said shoe having a horizontal segmental flange, the bottom face of said flange curved slightly upward at the forward end, a vertical, wedge-like, curved flange extending below said horizontal flange, said vertical flange increasing in depth from the forward end for a substantial distance towards the rear end of said shoe, whereby the depth of the groove made in said pipe end by the rear end of said vertical flange may be varied by adjusting said shce on the vertical leg of said bracket.

2. In an end former for shaping the bell end of a concrete pipe in a pipe machine having a cylindrical core, an angular bracket, said bracket having a pair of legs, one horizontal and one vertical, slots in said horizontal leg, screws attached to the top of said core and extending through said slots and holding said bracket adjustably in place on said core, a shoe, said shoe having a horizontal segmental flange, an upstanding lug on said horizontal flange, a vertical, wedge-like flange extending below said horizontal flange, said vertical flange increasing in depth from the forward end towards the rear end of said shoe, said upstanding lug of said shoe secured to the vertical leg of said bracket, whereby the width of the groove made in said pipe end by said vertical flange may be varied by adjusting said horizontal leg of said bracket on the top of said core.

3. In an end former for shaping the bell end of a concrete pipe in a pipe machine having a cylindrical core, an angular bracket, said bracket having a pair of legs, one horizontal and one vertical, a shoe attached to the vertical leg of said bracket, said shoe having a horizontal segmental flange, the bottom face of said flange curved slightly upward at the forward end, an upstanding lug on said horizontal flange, a vertical curved flange extending below said horizontal flange, said vertical flange increasing in depth from the forward end for a substantial distance towards the rear end of said shoe, said upstanding lug of said shoe adjustably secured to the vertical leg of said bracket, whereby the depth of the groove made in said pipe end by said vertical flange may be varied by adjusting said upstanding lug on the vertical leg of said bracket.

4. An end former for concrete pipe in a pipe machine having a cylindrical core, said former comprising, an angular bracket, said bracket having a pair of legs, one horizontal and one vertical, said horizontal leg adjustably attached to the top of said core, open-ended slots in said horizontal leg, screws attached to the top of said core and extending through said slots and holding said bracket adjustably in place on said core, a shoe for shaping the groove end of the pipe, said shoe having a horizontal segmental flange, the bottom face of said flange curved slightly upward at the forward end, an upstanding lug on said horizontal flange, the inside edge of said horizontal flange curved to correspond substantially to the surface of said core, a vertical, wedge-like, curved flanged extending below said horizontal flange, said vertical flange increasing in depth from the forward end for approximately two-thirds of the distance towards the rear end of said shoe, said upstanding lug of said shoe adjustably secured to the vertical leg of said bracket.

5. In an end former of the character described for concrete pipe, a shoe, said shoe having a horizontal segmental flange extending over the outside perimeter of the pipe end, the bottom face of said horizontal flange curved slightly upward at the forward end, a vertical curved flange extending downwardly from the bottom face of said horizontal flange, said curved vertical flange increasing in depth and width from the forward end of said shoe for a substantial distance towards the rear end of said shoe, whereby the forward end of said horizontal flange and said vertical flange, when encountering pieces of crushed rock in the concrete, will press these further into the concrete mixture by a wedging action and produce a better trowel-like finished surface.

6. In an end former for concrete pipe in a pipe machine having a cylindrical core, a bracket attached to said core, a shoe, said shoe having a

horizontal segmental flange extending over the outside perimeter of the pipe end, a vertical curved flange extending downwardly from the bottom face of said horizontal flange, said curved vertical flange increasing in depth and width from the forward end of said shoe for a substantial distance towards the rear end of said shoe, adjustable means connecting said shoe to said bracket permitting said horizontal flange to be inclined upwardly from the horizontal if desired, whereby to enable said shoe to exert a greater wedging action on the crushed rock in the concrete surface and also to vary the depth of the groove made by said shoe in the pipe end.

OSCAR TUERCK.