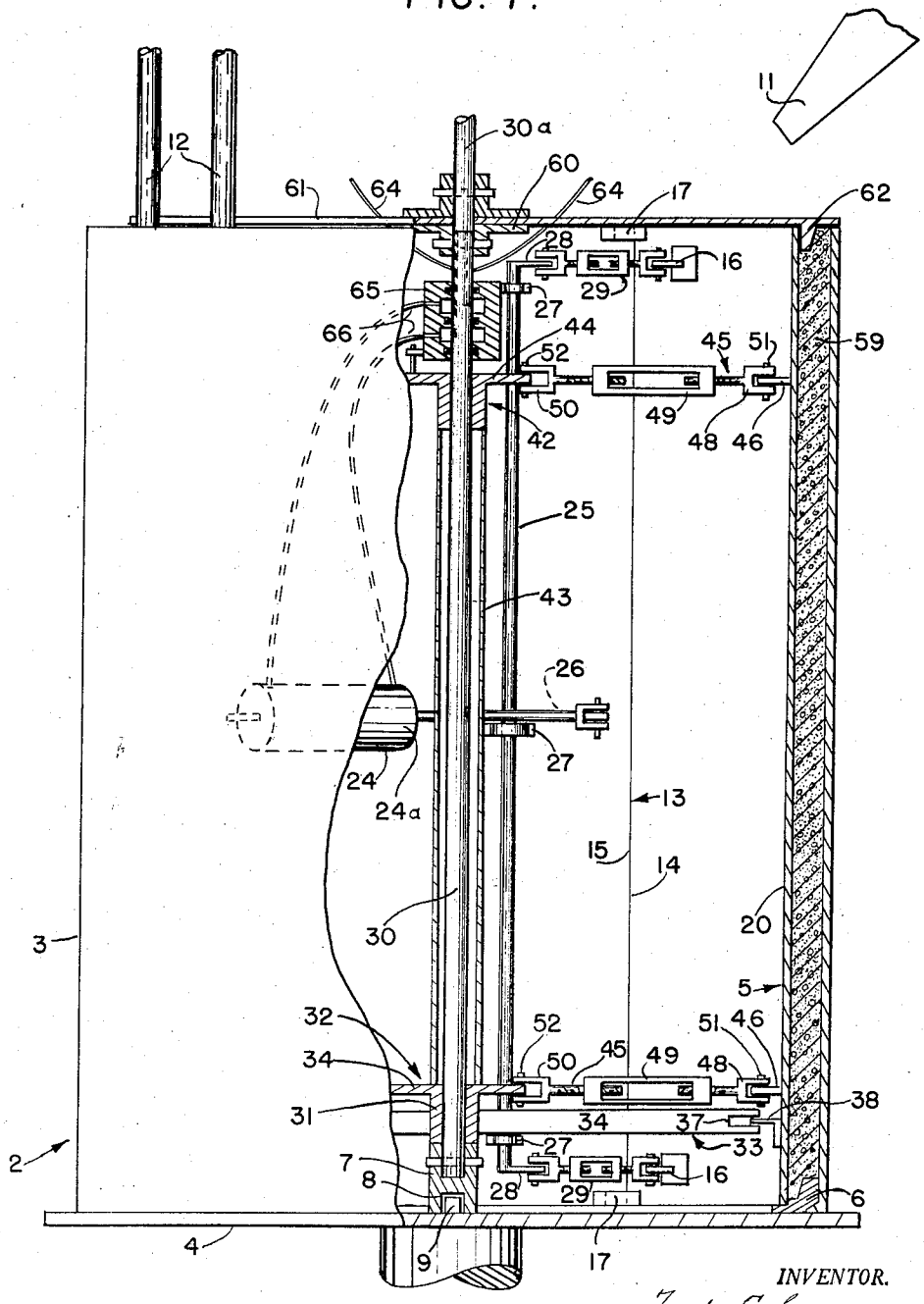
March 24, 1959 F. C. LOWE 2,878,545

COLLAPSIBLE CORES FOR CONCRETE PIPE

Filed May 17, 1954 3 Sheets-Sheet 1

FIG. 1.



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COLLAPSIBLE CORES FOR CONCRETE PIPE

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FIG. 2.

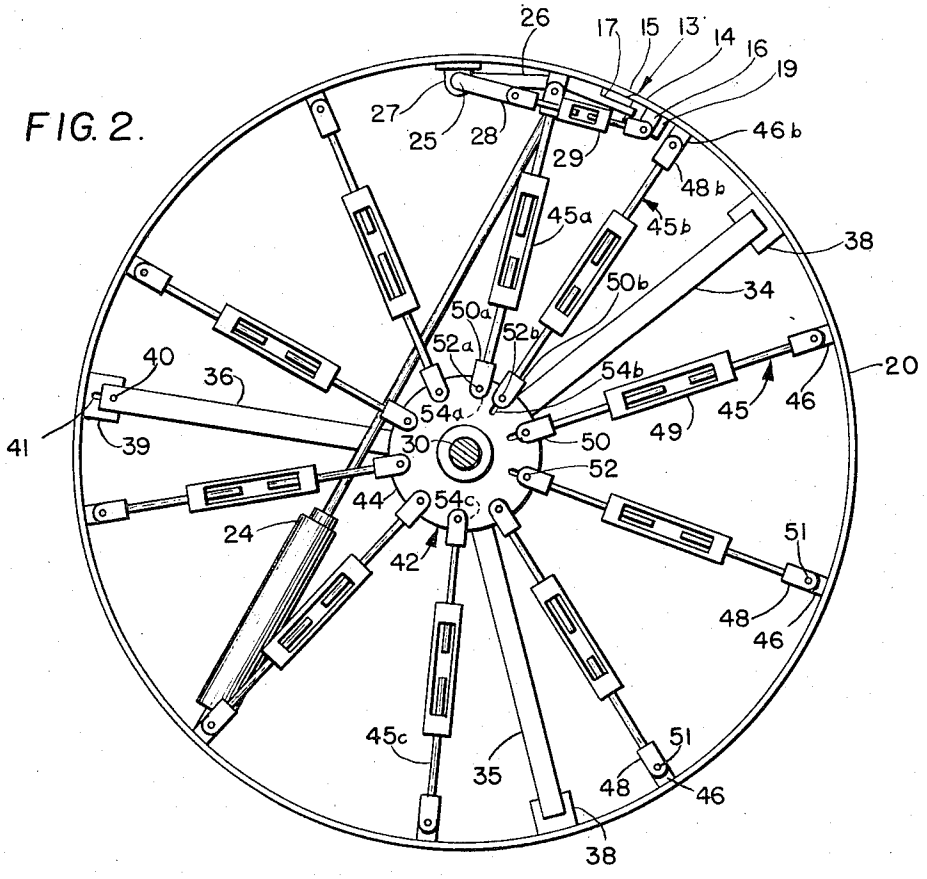
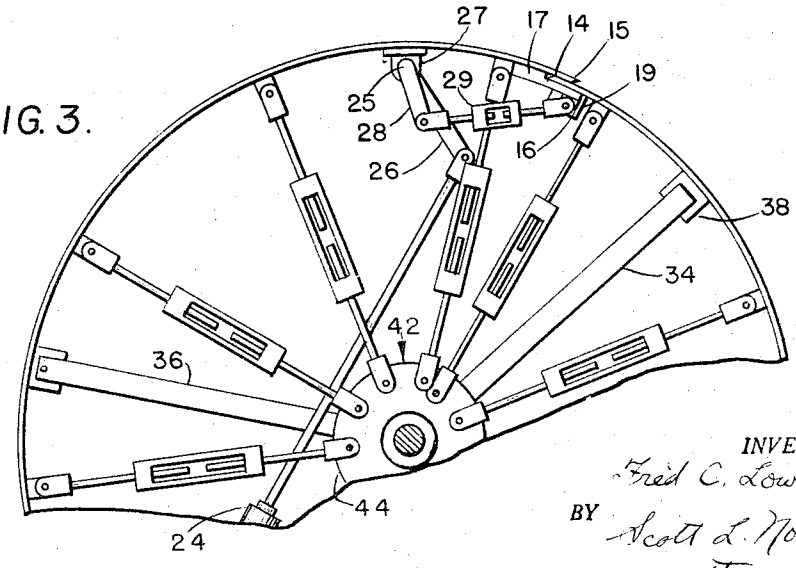


FIG. 3.



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COLLAPSIBLE CORES FOR CONCRETE PIPE

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FIG. 4.

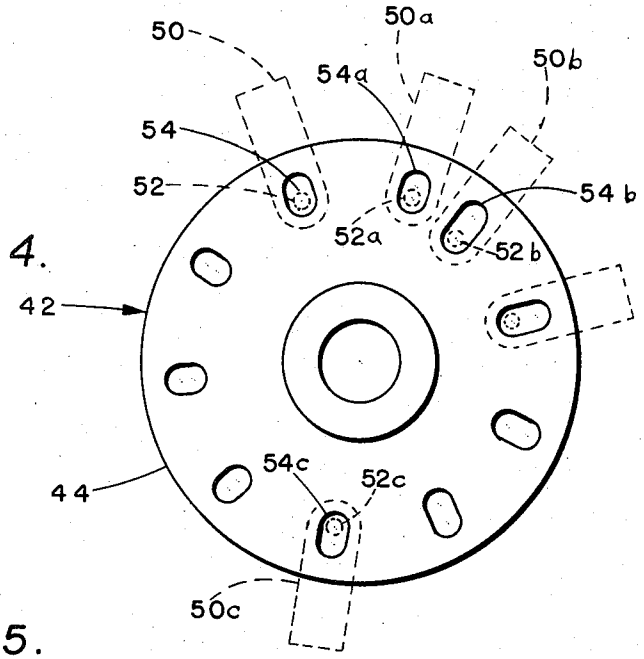
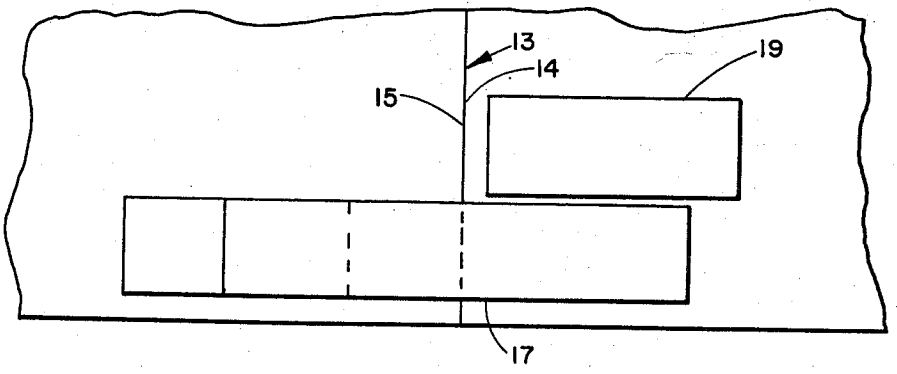


FIG. 5.



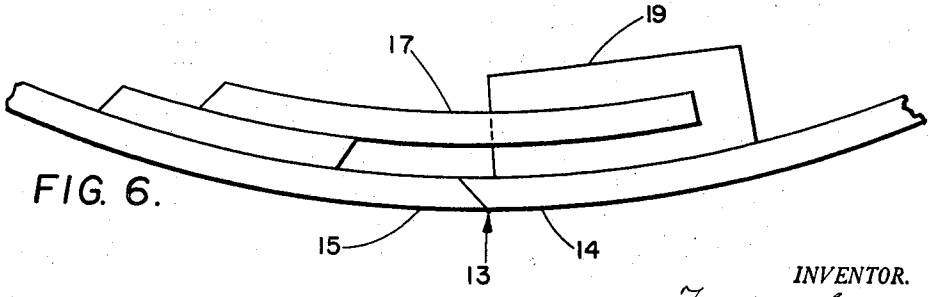


FIG. 6.

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2,878,545

COLLAPSIBLE CORES FOR CONCRETE PIPE

Fred C. Lowe, Phoenix, Ariz.

Application May 17, 1954, Serial No. 430,030
5 Claims. (Cl. 25—128)

This invention concerns improved collapsible cores for moulding concrete pipe.

Heretofore concrete pipe has been made by tamping moist mix into a mould composed of an outer shell and a core. The mould was rotated during the process. Two main types of cores have been used. One type of core remains stationary while the outer shell and the pipe being formed, rotate around it. The core acts as a trowel and produces a pipe with smooth interior surfaces. Wear on the core surfaces, however, is excessive, and the cores or their surfaces have to be replaced often.

The other type of core rotated with the outer shell and the pipe being formed and was collapsed and withdrawn when the mould was filled and the pipe formed. This type was made of rolled sheet metal.

One of the objections to this type of mechanism was that the core could not be withdrawn to produce a perfect inner surface unless it was collapsed excessively so that no part touched and damaged the pipe during withdrawal. This type of core would not, in practice, assume a true round shape when collapsed, but was oval in section and this made withdrawal difficult. Furthermore, bending of the sheet metal of the core caused distortion and a true cylindrical core surface could not be maintained without constant reworking and shaping of the sheet metal.

In view of the foregoing, one of the objects of my device is to provide a core which can be evenly collapsed circumferentially so that it can be withdrawn from the mould without touching the moist concrete of the freshly formed pipe.

Another object is to provide a core for concrete pipe moulding which has a moulding shell of sheet metal and mechanism therewithin including a number of radial spacers and a power driven mechanism for over-lapping a longitudinal seam in said casing; said parts being arranged so that said spacers force the shrunk casing to a true cylindrical form.

Still another object is to provide a concrete pipe mould, as aforesaid, with a collapsible core, as stated, so that the core may be rotated with the outer shell of the mould and thus eliminate wear as by troweling during pouring and tamping while forming the pipe; the structure further enabling the end joint trowel to compress the upper end of the pipe being formed sufficiently to form a hard pressed end joint without riding out of the pipe during the finishing of the moulding.

Other objects will appear hereinafter.

I attain the foregoing objects by means of the devices, parts, and combination of parts shown in the accompanying drawings in which—

Figure 1 is a side elevation of a pipe mould with parts of the outer casing broken away to show my improved core, and the interior construction thereof.

Figure 2 is a plan view of my improved cement pipe moulding core with top portions sectioned off, showing the core and its collapsing mechanism with the core casing expanded.

Figure 3 is a similar view of the core, in part, with the core casing contracted.

Figure 4 is a plan view of a spoke hub, drawn on an enlarged scale, and

Figure 5 is an inside elevational view of a fragment of the core casing, showing the edge positioning prongs; and

Figure 6 is an edge view of said fragment.

Similar numerals refer to similar parts in the several views.

Referring to Figure 1 of the drawings numeral 2 indicates a concrete pipe mould, generally, wherein 3 is the outer mould shell which rests on and may be fastened to rotating table 4. A ring end joint forming pallet 6 included within the bottom of this shell also rests on the table and forms a positioning means for core 5 which has my improved collapsing mechanism including a hub shaft 30 and a shaft collar 7 which is bored axially to provide a socket 8 which bears on boss 9 in the center of table 4 and aids in positioning and centering core 5.

Except for the core, the other parts, above mentioned, are conventional and need no detailed description. Additional moulding devices include the concrete feed chute 11, and the mechanically operated tampers 12.

The outer casing 20 of the core 5 has a longitudinal cut or seam 13. The adjacent edges 14 and 15, respectively, are beveled at an angle of approximately 45 degrees. The edges abut along this angular seam. The metal of the core casing is somewhat resilient and the above mentioned edges normally tend to stay together. To assist in positioning them properly so that the outer surface of the casing will form a true cylinder in its expanded position there are arcuate blocking prongs 17 near each end of the case which bear against block 19.

Guide blocks 19 bear against the inner edges of prongs 17 and maintain the end edges of the abutting edges 14 and 15 in aligned relation at seam 13.

A hydraulic or air cylinder 24 is pivotally attached to the inner face of the casing at a position approximately opposite seam 13. The piston of this hydraulic cylinder is pivoted to lever 26 on toggle shaft 25. Toggle shaft 25 is journalled in lugs 27 on the inner face of casing 20, and adjacent edge 15. At each end of this shaft, and near the end edges of casing 20, there are toggle levers 28 which are pivotally attached to links 29 and these in turn pivotally connected to lugs 16 adjacent edge 14. These toggle parts are arranged so that inward motion of lever 26 will cause edge 14 to be displaced inwardly, relative to edge 15, and then drawn within edge 15 so as to circumferentially shrink the casing body. When displaced in this manner edge 14 is held under prongs 17 which hold it in a definite overlapped position.

Normally this would shrink the casing on its diameter at right angles to seam 13 and not lessen its diameter which extends through the seam. That is, when shrunk, the casing would be oval and not round. The mechanism hereinafter described for forcing the casing to assume a true cylindrical shape when it is drawn in and shrunk by the toggle lever mechanism includes the important elements of my invention.

Extending axially within the core there is a stationary shaft 30. The chief function of this shaft is to lift the core out of the moulded pipe, by means including a lifting spider 33.

Above collar 7 on the lower end of shaft 30 there is a lower spoke hub 32 which has a cylindrical lower sleeve 31 and a flange 34 on its upper portion. The lifting spider 33 has three radial legs 34, 35 and 36 extending radially from sleeve 31. Legs 34 and 35 are attached to horizontal lugs 38 on the inner face of the core which work in horizontal notches 37 in the ends of these legs. This means of attachment allows the core

casing 20 to be lifted by shaft 30 and also permits radial movement of the lug in the notches when the casing expands and contracts. The third leg 36 is held from rotary motion by lugs 39 and held in place by a pin 40 extending through slots 41 in lugs 39. In this way rotation of the casing is communicated to the hub 32.

An upper hub sleeve 42 has a flange 44, and is positioned near the upper end of the core. Sleeves 32 and 42 are joined by a length of tubing 43. Both sleeves journal on shaft 30, and turn with core casing 20 as it rotates on table 4.

Radial core shaping spokes 45 extend from each of the hub flanges 34 and 44 to lugs 46 on the inner face of casing 20. These lugs are equally spaced and are disposed in two planes corresponding to those of the hub flanges.

Each spoke has a clevis 48 at its outer end and a clevis 50 at its inner end and is provided with a turn buckle 49 for varying its length. Clevises 48 are joined to lugs 46 by pins 51 and inner clevises 50 are joined to said hub flanges by pins 52 which pass through slots 53 or slots 54 in the respective flanges. These spokes control and limit the expansion and contraction of the walls of the core.

As here illustrated there are ten spokes radiating from each hub flange.

When the core is expanded for molding, as shown in Figure 2, the clevises 50 are drawn to the outer limit of their travel in slots 54. When the core is contracted for withdrawal from a molded pipe the clevises 50 are forced to the innermost limit of their travel in these same slots.

Referring to Figure 4, note that slot 54*a* receives pin 52*a* which extends through clevis 50*a* (Figure 2) and that this clevis supports spoke 45*a* which extends to that portion of the casing nearest seam edge 15 within which edge 14 is drawn when the core is contracted.

Slot 54*a* and the next following four slots positioned counter-clockwise from it have their radially inwardly disposed edges spaced a sufficient distance inward so that the outer surface of the core 20 will be drawn inward to provide adequate clearance from the inner face of the molded pipe 59 so that the core may be withdrawn from the pipe without touching or scraping. The remaining five slots have varying depth which increases progressively counter-clockwise. The last slot 54*b*, receives pin 52*b* through clevis 50*b* and which is joined by spoke 45*b* to lug 46*b* nearest edge 14. The depth of this slot is sufficient so that edge 14 will assume its innermost position and assume an underlapped position relative to edge 15 as shown in Figure 3. The sixth, seventh, eighth and ninth slots have inward depths sufficient to force the right side of the core (as viewed in Figure 3) to assume a smooth curve leading to edge 14, when inwardly displaced.

On the upper portion of shaft 30 a flange 60 is attached and this, in turn, is bolted to core cover plate 61 which carries the end joint finishing trowel 62.

Tubes 64 are brought out through plate 61 and connected through valves to a source of pressurized hydraulic fluid (not shown). Beneath flange 60 these tubes connect to passageways in shaft 30 and these passageways are, in turn, ported to open into a rotary collar 65 from which tubes 66 carry fluid to the ends of cylinder 24.

In use the outer shell 3 is placed on table 4 with its axis aligned with that of boss 9. At the same time ring pallet 6 is placed inside this shell and rests on table 4. The core 5 is then lowered into the shell so that collar 7 centers on boss 9. This completes the mold 2. Cement mix is then introduced from chute 11 while the mold is rotated on table 4, and is packed down by tampers 12. During this molding process outer shell 3, and the core outer casing 20 rotate together, while the hub shaft 30, flange 60 and cover plate 61 remain stationary. As the mold fills and nears the top the mix 59 is troweled, packed down and the joint groove formed by trowel 62 as the cement of the pipe being molded passes under it. As here illustrated, rotary motion of the table and shell is clockwise when viewed from above.

After the mold is filled and the upper end joint formed the core casing 20 is contracted by admission of air or fluid under pressure to the inner end 24*a* of cylinder 24. This draws lever 26 inward, and toggle levers 28 draw links 29 inward and toward casing edge 15 so that seam 13 is broken and edge 14 slips under edge 15 and underlaps it. This underlapped position is held by arcuate guide prongs 17. The action of the toggles at each end of casing 20 is to shrink the circumference of the casing and force the edges of seam to the lapped position shown in Figure 3. As the casing shrinks, its left half, positioned by the first five spokes, from spokes 45*a* to 45*c*, draws inward on a substantially uniform circular curve the distance permitted by the radial movement of clevises 50 on hub flanges 34 and 44 as controlled by slots 54*a* through slot 54*c*.

The limiting action of spokes on the right side of core 20 as governed by spokes 45 and clevises 50 controlled by slots 54*f* through 54*b* forces this side of the casing to assume a slight spiral curve. The general effect of the shrinkage, however, is that the core assumes a substantially cylindrical shape with a diameter sufficiently smaller than the inside of the molded pipe so that the core may be lifted from the pipe without touching it at any place. This is done by raising the upper extension 30*a* of shaft 30. The outer shell and ring pallet and molded pipe are then removed from table 4 for curing and drying.

While I have specified that the positioning spokes 45 have clevises 50 which move relative to hub slots 54 it is considered that equivalent structure could be provided by having the pins 51 of clevises 48 move in slots in lugs 46. Likewise the spokes 45 could have variable lengths between outer and inner limits. The salient feature is that the curvature of the walls of core 20 is controlled in the expanded and contracted position by the spokes. It is to be noted that as the core is contracted by the toggle structure the outer clevis pins of the spokes first act as fulcrums, as the contour of the core changes and becomes smaller, and then the pins on the inner clevises act as pivots, as the underlap takes place and the abutting edges of seam 13 pass each other.

It is also considered that the position of cylinder 24, as specified, is not critical but may be supported at different positions within the core 20 so long as motion is communicated to the toggle mechanism.

It is considered that the cooperation of the toggle mechanism and the spokes with their inner and outer limited positions provide the controlled expansion and contraction of the core body, as desired. The relative positioning of the edges 14 and 15 is achieved by these elements, although the arcuate prongs 17 assist in holding the edges in shrunk underlapped position.

One result of this structure is that the core shrinks only a sufficient distance so that it may be easily withdrawn from the molded pipe. Minimum bending of the core casing makes fracture and deforming unlikely.

Another result of the core structure is that, until shrunk or contracted the core is packed tightly against the molded pipe and turns with it and the outer shell. Plate 61 which remains stationary on shaft 30 and carries joint forming trowel 62 which cannot be lifted out of mold 2 by the riding motion of the trowel until the core is shrunk, and freed from contact with the inner wall of the molded pipe. The trowel can, therefore, exert great compressive force on the upper end of the molded pipe and the cement mix can be adequately compacted.

In addition to the modified structure, above mentioned, other and further modifications may suggest themselves

to those familiar with the art. All such modifications, however, may well remain within the spirit of the invention.

I claim:

1. In a rotary cement pipe mold having an outer shell and an end forming pallet, a circular collapsible core body resting on said pallet having a longitudinal seam with the abutting edges thereof meeting at an angle relative to the radius of said body, an axially positioned lifting shaft, a lifting spider attached to the lower end of said lifting shaft, a hub structure including vertically spaced sleeves journalled on said shaft, each having circular flanges with radial annularly arranged slots thereon, power operated toggle mechanism on each end of said body adjacent the abutting edges of said seam for collapsing said core body to permit withdrawal from a pipe formed in said mold by displacing one of said seam edges radially inward relative to the other seam edge, and for drawing said inwardly displaced edge into an underlappping position relative to said other edge, and mechanism for controlling the outer contour of said core body when expanded for molding and when contracted for withdrawal, consisting of spokes extending substantially radially from spaced positions around said hub flanges to the inner wall of said core body, and having a slidable pivoting connection between said hub flange and said wall limiting the outward movement of the wall of said core body, when expanded, so that said core body assumes a circular form, and limiting its inward movement, when contracted, so that said core body assumes a spiral form with one edge underlapping the other.

2. In a rotary cement pipe mold having an outer shell attachable to a horizontal rotating table and enclosing a circular end joint forming pallet, a collapsible core of the split cylinder type, having a body including a longitudinal seam with abutting edges, an axially positioned stationary lifting shaft, a lifting spider journalled on the lower end of said shaft having radial legs attached to the inner face of said body by radially expansible joints and a positioning collar for removable attachment to the center of said rotating table, a hub structure including vertically spaced hubs journalled on said shaft having circular flanges with clevis pin slots arranged in spaced relation adjacent their perimeters, spokes extending radially from said hubs joined by clevises at their inner ends to said hubs with pins extending through said hub flange slots, and attached at their outer ends by clevises and pins to lugs on the inner walls of said body, power operated toggles on each end of said body attached by pins to lugs adjacent the abutting edges of said seam moving said edges from abutting position when said core is expanded for molding to an over and underlapping position when said core is contracted for withdrawal from a molded pipe; said slots in said hub being disposed so that when said core body is expanded the clevis pins securing the inner end clevises of said spokes are at the outer ends of said slots and said spokes are holding the walls of said core to conform to a true cylinder, and when said core is collapsed said pins are at the inner ends of said slots and the walls of said core body are held to assume a substantially semicircular form of lessened radius than when expanded throughout the portion adjacent the overlapped edge of said seam and a substantially spiral curve throughout the portion adjacent said underlapping edge.

3. In a rotary cement pipe mold having an outer shell attachable to a horizontal rotating table and inclosing a circular end joint forming pallet, a collapsible core of the split cylinder type, having a body including a longitudinal seam with abutting edges, an axially positioned stationary lifting shaft, a lifting spider journalled on the lower end of said shaft having radial legs attached to the inner face of said body by radially expansible joints and a positioning collar for removable attachment to the center of said rotating table, a hub structure including

vertically spaced hubs journalled on said shaft having circular flanges with clevis pin slots arranged in spaced relation adjacent their perimeters, spokes extending radially from said hubs joined by clevises at their inner ends to said hubs with pins extending through said hub flange slots, and attached at their outer ends by clevises and pins to lugs on the inner walls of said body, power operated toggles on each end of said body attached by pins to lugs adjacent the abutting edges of said seam moving said edges from abutting position when said core is expanded for molding to an over and underlapping position when said core is contracted for withdrawal from a molded pipe; said slots in said hub being disposed so that when said core body is expanded the clevis pins securing the inner end clevises of said spokes are at the outer ends of said slots and said spokes are holding the walls of said core to conform to a true cylinder, and when said core is collapsed said pins are at the inner ends of said slots and the walls of said core body are held to assume a substantially semicircular form of lessened radius than when expanded throughout the portion adjacent the overlapped edge of said seam and a substantially spiral curve throughout the portion adjacent said underlapping edge and a stationary closing plate on said axial shaft covering the top of said mold and supporting an end joint forming trowel.

4. In a rotary cement pipe mould having an outer shell attachable to a horizontal rotating table and enclosing a circular end joint forming pallet, a collapsible core of the split cylinder type, having a body including a longitudinal seam with abutting edges, an axially positioned stationary lifting shaft, a lifting spider journalled on the lower end of said shaft having radial legs attached to the inner surface of said body by radially expansible joints and a positioning collar for removable attachment to the center of said rotating table, a hub structure including vertically spaced hubs journalled on said shaft having circular flanges, radially disposed spokes on said hub flanges, means for connecting the outer ends of said spokes with limited relative radial movement to the inside of said cylindrical core, means carried on the inside surface of said core to contract and expand said core; said last mentioned means consisting of toggle links mounted on the inside surface of said core at each end of said core and extending across said seam, a toggle operating shaft journalled on the inner surface of said core, extending longitudinally relative to said core, and adapted to actuate said toggle links, and a hydraulic cylinder mounted on the inside of said cylindrical core and connected to said toggle operating shaft.

5. In a rotary cement pipe mould having an outer shell attachable to a horizontal rotating table and inclosing a circular end joint forming pallet, a collapsible core of the split cylinder type, having a body including a longitudinal seam with abutting edges, an axially positioned stationary lifting shaft, a lifting spider journalled on the lower end of said shaft having radial legs attached to the inner face of said body by radially expansible joints and a positioning collar for removable attachment to the center of said rotating table, a hub structure including vertically spaced hubs journalled on said shaft having circular flanges with clevis pin slots arranged in spaced relation adjacent their perimeters, spokes extending radially from said hubs joined at their inner ends to said hubs and attached at their outer ends at spaced positions to the inner walls of said cylindrical body, power operated toggles on each end of said body attached adjacent the abutting edges of said seam and adapted to move the edges of said seam from an abutting position when said core is expanded for moulding, to an overlapping and underlapping position when said core is contracted for withdrawal from a moulded pipe; said slots in said hub flanges being disposed so that when said core body is expanded said spokes hold the walls of said core so that its outer surface is in the shape of a true

cylinder, and when said core is collapsed the walls of said core body are held to assume a substantially cylindrical shape, arcuate prongs on the inner surface of said cylindrical body spaced from the overlapping edge of said core body when contracted, for receiving the underlapping edge of said seam and limiting its inward movement.

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