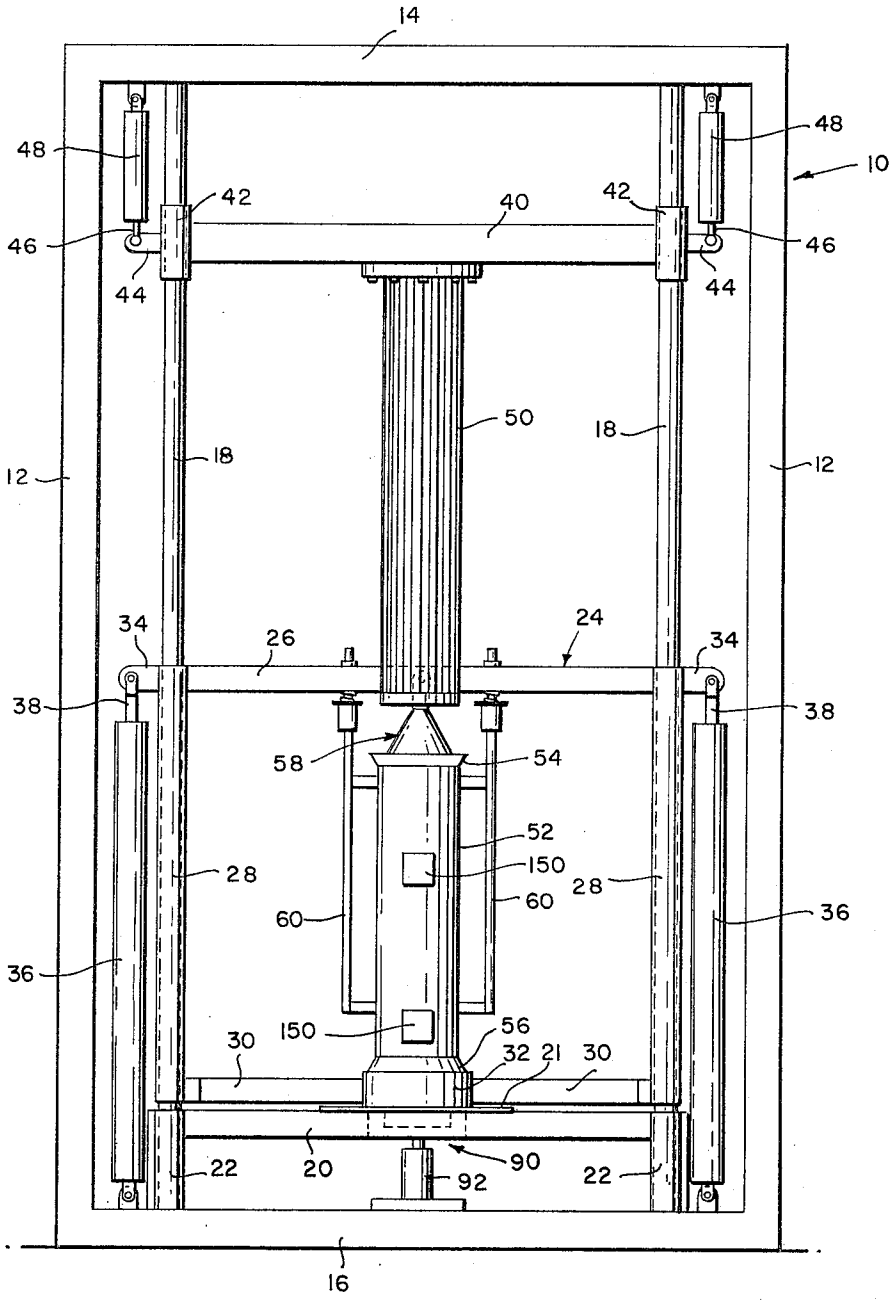
Sept. 20, 1966 L. C. GOURLIE 3,273,216

AUTOMATIC PIPE MAKING MACHINE

Filed Dec. 10, 1963 4 Sheets-Sheet 1

FIG. 1



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AUTOMATIC PIPE MAKING MACHINE

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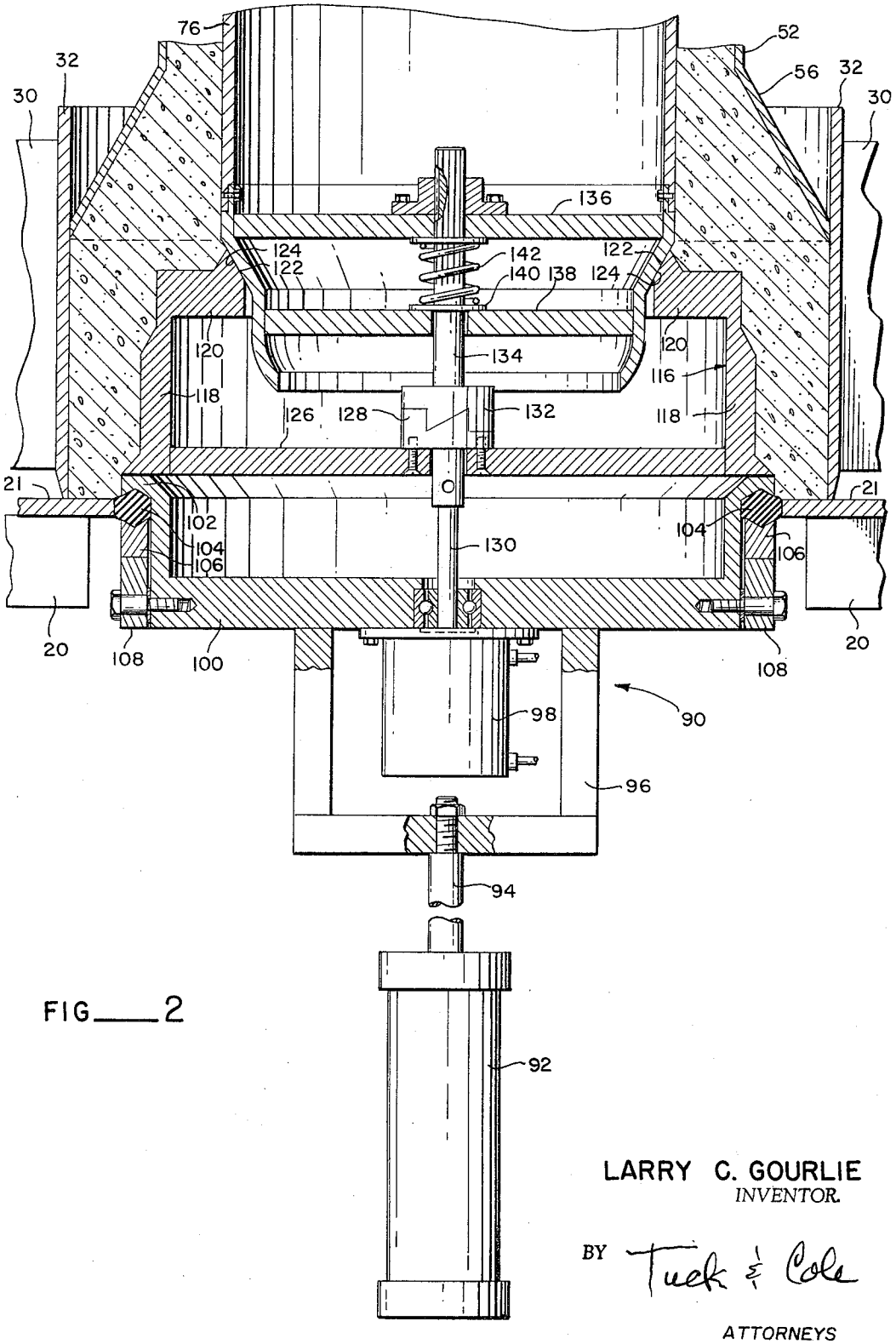


FIG. 2

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Sept. 20, 1966 L. C. GOURLIE 3,273,216

AUTOMATIC PIPE MAKING MACHINE

Filed Dec. 10, 1963 4 Sheets-Sheet 3

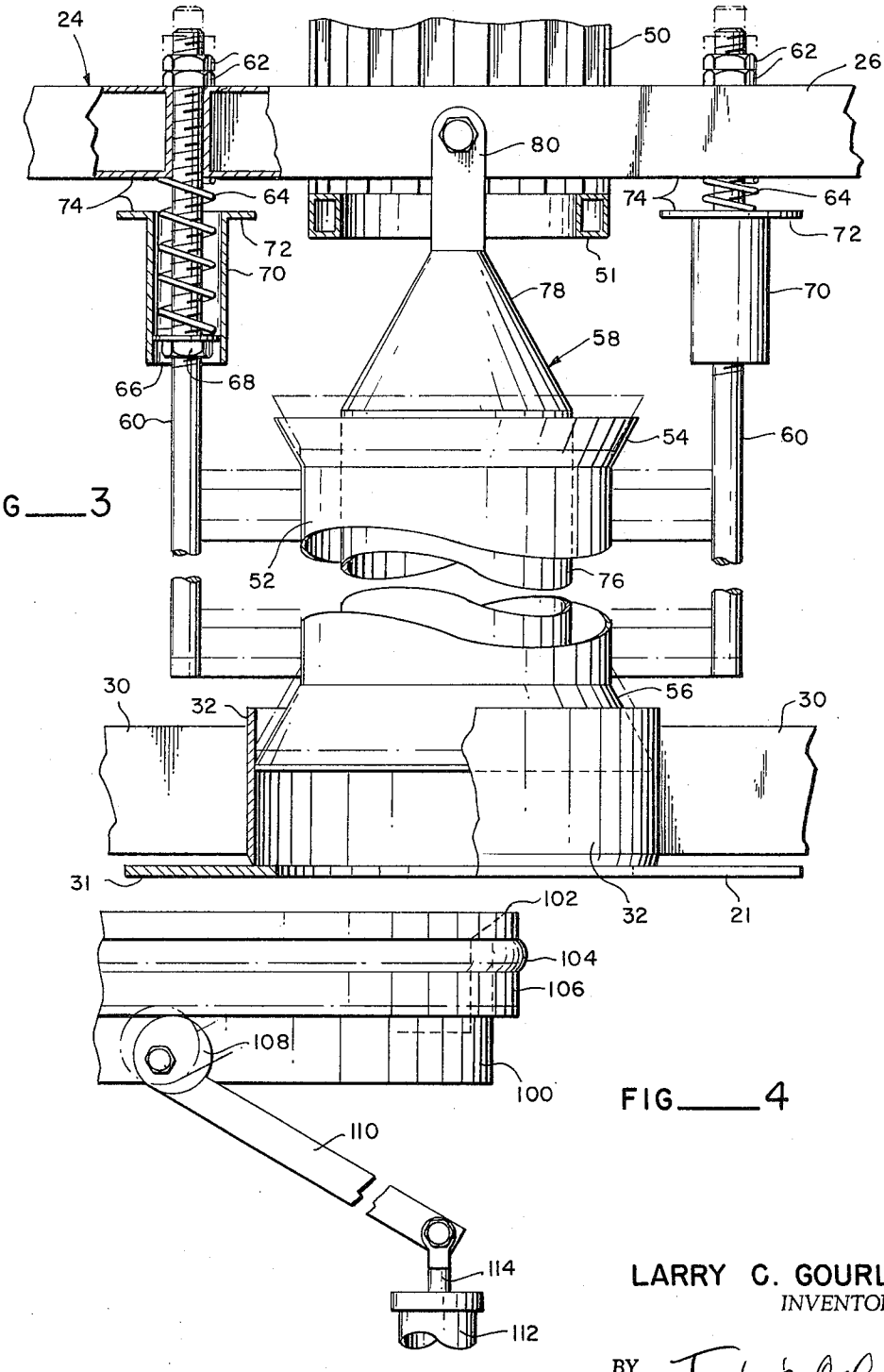


FIG. 3

FIG. 4

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AUTOMATIC PIPE MAKING MACHINE

Filed Dec. 10, 1963 4 Sheets-Sheet 4

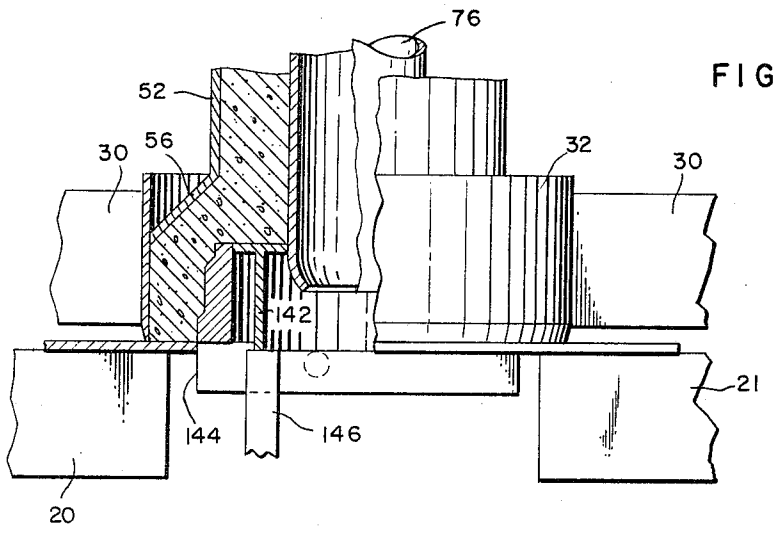


FIG. 5

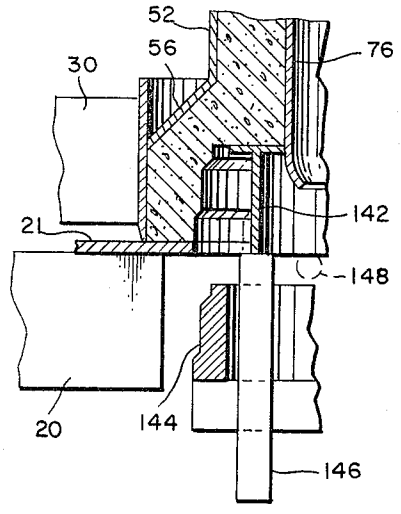


FIG. 6

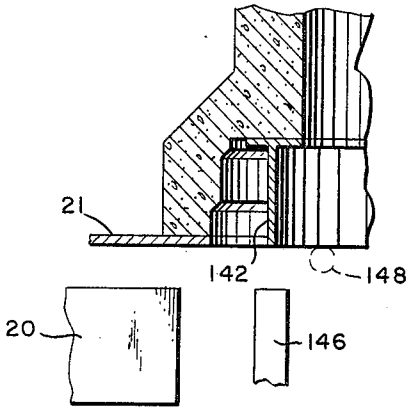


FIG. 7

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United States Patent Office 3,273,216 Patented Sept. 20, 1966

3,273,216

AUTOMATIC PIPE MAKING MACHINE

Larry C. Gourlie, Everett, Wash., assignor, by mesne assignments, to Graystone Corporation, Seattle, Wash., a corporation of Washington

Filed Dec. 10, 1963, Ser. No. 329,592
11 Claims. (Cl. 25—30)

This invention relates to new and useful concepts and improvements in an apparatus for making socket and bell types of concrete pipe. More particularly does this invention relate to a new and useful automatic concrete pipe making machine in which quality and uniformity of the pipe is greatly increased as a result of the features of the invention. This invention may be further understood by reference to my copending U.S. application, Serial No. 96,999, filed March 20, 1961, now U.S. Patent No. 3,119,164.

Concrete pipe has long been used for many purposes because of its long life and durability and because of the low cost of the materials used in the concrete itself. While concrete pipe competes favorably with pipe made of other materials it has been found that ever increasing costs of labor and materials necessitate automating the manufacturing process. Labor costs of course are reduced by the nature of the machine and the method involved and also by virtue of the fact that manual handling of the pipe is completely eliminated during molding, stripping and conveying of the green pipe away from the machine. At the same time that handling of the green pipe by human hands is eliminated, it has been found as a result of this apparatus that the quality of the pipe is maintained.

In essence, the new apparatus involved in this invention utilizes a two piece mold jacket in which the main section of the jacket is designed to float on resilient mountings in order to concentrate excesses of mix poured into the cone or shoulder region of the bell. The lower end of the jacket is comprised of a ring which maintains a substantially tight seal with the pallet on which the pipe is being formed. The upper or main section of the jacket moves with respect to the ring which is maintained generally stationary during the molding operation while the upper or main section floats. The core of the mold is designed to rotate in conjunction with a unique bell former in which the lower portion of the bell former is stationary and forms a sealing engagement with the pallet hole and in which the upper portion of the bell former rotates and drives the core. At the same time the two piece jacket and the core can be removed simultaneously from the green pipe by virtue of a unique hold down feature allowing for simultaneous withdrawal of the jacket and core without any distortion, weakening or breaking down of the freshly formed green pipe. This unique combination of features embodied within apparatus is responsible for this significant step forward in the pipe making art.

Accordingly it is an object of this invention to provide apparatus for making concrete pipe which eliminates need for large expensive or conventional type machinery adapted to conventional methods.

Another object of this invention is to provide apparatus for making concrete pipe which are simple and thus much less expensive than conventional methods and machines and yet which maintain high quality and high volume production.

Still another object of this invention is to provide apparatus for forming concrete pipe which eliminate costly manual handling of the pipe.

A further object of this invention is to provide apparatus for forming concrete pipe which permit easy and rapid changes from one size pipe to another.

Yet another object of this invention is to provide apparatus for forming concrete pipe in which conventional tolerances and specifications are more easily and consistently met.

An even further object of this invention is to provide apparatus for formng concrete pipe which allow the steps of the method to be performed by sequentially timed, automatic control means.

Still a further object of this invention is to provide apparatus for molding concrete pipe which allows a wide range of lengths, sizes and diameters in the pipe to be produced without detriment to quality or volume of production.

Another object of this invention is to provide apparatus for the molding of concrete pipe which result in a uniform length for a given type of pipe within very close dimensional tolerances.

Yet a further object of this invention is to provide apparatus for the molding of concrete pipe which because of simplicity allow the pipe to be made singly or in multiples in a single sequence of given operational steps.

Other objects and advantages of this invention will become subsequently apparent. They will be found to reside in the details of the construction of the apparatus and its operation. Reference will be had to the accompanying drawings forming a part of this disclosure wherein like numerals will refer to like parts throughout and in which:

FIGURE 1 is a general elevational view of the apparatus of this invention and which represents the embodiment of one device by which the method of this invention may be carried out;

FIGURE 2 is a cross sectional partial view of the bell former section of the apparatus;

FIGURE 3 is a partial elevational view showing the nature of the mounting of the two-piece jacket on the cross head;

FIGURE 4 is a partial elevational view showing the manner in which the stationary portion of the bell former is sealed with respect to the pallet;

FIGURE 5 is a partial elevational view in cross section showing a bell supporting means in conjunction with the bell former and lower end of the core as used for larger pipes;

FIGURE 6 is also an elevational partial cross section view of the elements shown in FIGURE 5 and also showing the bell former withdrawn from the lower end of the pipe; and

FIGURE 7 is a view of the same elements of FIGURES 5 and 6 in which the pallet, the green pipe, and the bell supporting means have been lifted off the machine support elements to be transferred away from the molding station.

Referring now to the drawings it will be seen, especially by reference to FIGURE 1, that the pipe molding machine of this invention, generally designated by the number **10**, is comprised of a generally upstanding rectangular frame structure having side frame members **12**, a top supporting frame member **14**, and bottom supporting member **16**. An understanding of the supporting structure is not necessary to an appreciation of the novel features and elements of this machine and apparatus and method. Within the frame structure, which may take most any desirable form, there will be located two spaced-apart generally vertical guide rods **18**. As can be seen the guide rods extend from the bottom of the main supporting frame to the top thereof and are rigidly supported within said frame. The guide rods are maintained as closely as possible in a parallel relationship to accommodate other elements which are slidably received thereon. As the lower end of the machine structure and extending between the guide rods **18** will be found a pallet supporting table or structure **20** which is so designed that a central area or bell former is left unobstructed therein to permit the

raising and lowering of the bell former during the molding process. It will be noted that the pallet supporting table **20** is connected to table support sleeves **22**. The sleeves **22** are in effect split structures to permit easy assembling and disassembling of the table from the machine in the event that it is desired to gain convenient access to other parts. It is not essential that the pallet supporting table **20** necessarily be attached to the guide rods **18** since it is only required that a rigid firm structure be provided on which to support pallet **21**. However, the table **20** as shown may have its height varied. A moveable mold supporting frame generally, shown by the number **24**, is slidably received on the guide rod **18**. It will be noted that the mold supporting structure **24** is comprised of a crosshead member **26** which extends generally horizontally between the guide rods **18**. The crosshead **26** is connected at each end thereof to the elongated guide sleeves **28** which are slidably received on rods **18**. The lower ends of the guide sleeves **28** are interconnected by ring support frame members **30**. The lower horizontal ring support members are rigidly attached to the clindrical ring **32** forming the lower portion of the two piece jacket of this invention. In effect, however, with the ring support frame members **30** and the ring **32** securely connected together, a lower frame piece for the moveable mold support **24** contributes to the defining of an essentially rigid rectangular structure for moving upwardly and downwardly on the rods **18**.

Brackets **34** are secured to the upper outside end of the guide sleeves **28** to reveive a pivotal connection with the actuating cylinders **36**. Cylinders **36** are secured as desired to rigid frame structure at the bottom end thereof with the cylinder piston rod **38** extending upwardly and pivotally attached to the brackets **34**. By simultaneous actuation of the cylinders the mold supporting frame **24** may be moved up and down on the guide rods **18** as desired. It will be appreciated that the actuating mechanism may be connected either from above or below as shown depending upon the preferences of those concerned. The cylinders shown are hydraulic. Other acceptable means could be devised for actuating the frame by those skilled in the art.

The upper end of the machine is provided with a hold-down crosshead support member **40** also supported on guide rods **18** by the guide sleeves **42**. Guide sleeves **42** have brackets **44** on the outsides of the sleeves for pivotally receiving the piston rods **46** of cylinders **48**. It will be seen that the cylinders **48** are substantially shorter than cylinders **36** since it is necessary to move crosshead **40** only through a restricted distance. Hold-down crosshead **40** has connected to the underside thereof either resiliently or rigidly an elongated split tubular hold-down cylinder **50**, the purpose of which will be described more fully hereinafter. The crosshead **26** in extending across the machine between the guide rods **18** requires that the hold-down cylinder **50** be split in order to permit said crosshead **26** to pass therethrough. It will be noted that the crosshead **26**, in its full down position so that the mold structure is resting on the pallet, is located at the lower end of the hold-down member **50** while at the same time the cylinders **48** hold said member **50** through crosshead **40** in its full up position. Thus, with hold-down member **50** split along its entire length to receive crosshead **26** the entire mold supporting frame **24** is permitted to slide unobstructedly up and down on guide rods **18** when cylinders **36** are properly actuated.

The molding elements of this machine are generally supported on and within the frame so far described. In their broadest aspects the mold elements comprise a two-piece jacket or outer mold member **52** having an outwardly and upwardly flared lip **54** and a downwardly and outwardly flaring bell shoulder or cone portion **56**. The shoulder portion **56** terminates above the pallet structure **21** and fits slidably and concentrically within the jacket ring **32**. The shoulder portion **56** is slidably received within the jacket ring **32** so that the main jacket portion **52** may move up and down through a short predetermined distance on floating type mountings. The mold elements are completed by a core member **58** which has a conical upper portion and which is small enough in diameter to define in conjunction with the outer mold elements a cylindrical cavity for the accommodation of concrete mix. It will be noted that both core **58** and jacket portions **52** and **32** are supported on the mold supporting frame **24**. It will also be noted that jacket frame members **60** are connected at both the bottom and top of the jacket portion **52** and extend upwardly to be mounted on crosshead **26** as to be spaced from hold-down **50**. The core member **58**, however, is supported from crosshead **26** by a connection interiorly of the hold-down **50**.

FIGURE 3 shows the mounting of the mold elements on the support frame **24** in greater detail. It will be noted that the jacket support frame members **60** extend generally vertically upwardly through crosshead **26** and that at the upper end thereof they have adjustable jacket pick-up members or nuts **62**. Mounted on said frame members **60** below crosshead **26** are compression springs **64** which have appropriate confining shoulders **66** in the form of a washer backed up by a nut **68** on the threaded member **60**. The washer **66** and nut **68** are merely illustrative of the manner in which the lower end of the compression spring **64** can be held on the frame members **60**. The spring container **70** envelopes spring **64**, with said container having flange **72** to abut the under surface of crosshead **60**. Thus, by virtue of the nut **68** and the adjusting nuts **62**, the distance or gap **74** which is the distance through which the outer jacket **52** will float can be adjusted as desired. Other means could be incorporated for floating the jacket and are intended to be included within the scope of this disclosure. Core member **58**, as can be seen, has an elongated main mold section **76**, an upper inwardly tapering cone section **78** and a hangar element **80** connected to the crosshead. Core **58** is rotatably mounted on hangar **80**.

FIGURE 2 shows a novel bell-forming structure as incorporated in the apparatus and which forms a part of the novel method of this invention. It will be seen that the jacket ring **32** and the lower portion of the main section **52** of the two-piece jacket are shown together with the lower end of the core in greater detail. The bell former structure, generally shown by the number **90**, comprises a raising and lowering cylinder **92** having a piston rod **94**. Piston rod **94** is connected to a bell former support **96** which may take many forms but which includes motor assembly **98**. The lower half of the bell former proper which is attached to the supporting assembly **96** includes a shallow cylindrical heavy walled member **100** to which the supporting assembly **96** is connected. The member **100** has outside flange **102** around the upper edge thereof, the underside of which is formed upwardly and inwardly as an upper confinement surface for a sealing gasket **104**. Extending concentrically around the outside of the upwardly facing stationary bell former member **100** below flange **102**, and spaced from flange **102** is a ring **106**. The upper edge or surface of ring **106** is slotted to define a lower confining surface for the underside of the compression seal **104**. Ring **106** is moved upwardly and downwardly by any desirable means. One way of actuating the ring or otherwise moving it up and down against seal **104** is to provide a pair of oppositely disposed cams **108** which can be off-center mounted round elements and which would be attached, as shown in FIGURE 4, to an actuating lever **110** which could be moved by cylinder **112** and piston rod **114**. Those skilled in the art will readily devise other equivalent means for moving ring **106** for compressing seal **104**. It will be noted that the stationary portion **100** of the bell former structure moves up enough to bring flange **102** just above the upper surface of the flat pallet **21**. Thus, seal **104** is brought into alignment with the edge of the hole in the pallet. When the

ring 106 is moved upwardly to compress seal 104 the seal deforms and pushes outwardly against the pallet hole to effectuate a tight seal between the stationary portion of the bell former and the pallet.

The upper portion of the bell former is rotatable and has main forming section 116 which is also circular and the outside wall of which is formed to the desired configuration. The upper part of the rotatable member 116 is open to permit the lower end of the core 56 to extend therethrough. Thus, rotatable member 116 has generally upstanding walls 118 and upper inside flange section 120 and an internally bevelled surface 122 for mating with the lower externally tapered surface 124 of the core. A jaw support member 126 is rigidly secured within the member 116 for supporting one half of jaw clutch 128. A shaft 130 extends upwardly from motor 98 and connects to jaw clutch member 128. Extending downwardly from the core is a jaw member 132 on the end of spline shaft 134 which in turn is mounted within clutch supporting structure 136 and 138. The spline shaft 134 meshes with the fixed member 136 in the core and is thus fixed against rotation relative to the core but is permitted to move axially therein. A fixed flange member 140 is rigidly connected to the shaft 134. Between the spaced apart support member 136 and 138 is disposed a compression spring 142 to bias the shaft 134 with its jaw clutch member 132 downwardly for engagement with the other half 128. The clutch members 132 and 128 are positive jaw clutch members for engagement in one direction only. It will be apparent to those skilled in the art that the structure herein shown is only illustrative of one way in which the elements may be designed.

FIGURES 5 through 7 show a means for supporting the barrel of the green pipe when the pipe is of such diameter as to be unable to support itself on the pallet 21. It will be noted that a circular T-shaped support member 142 is supported from within the confines of the bell former 144 by supporting element 146. The support element 146 is designed so that the bell former 144 can move up and down without being obstructed either by element 146 or by the support means 142. Note that when the bell is raised the upper edge thereof coincides with the horizontal portion of the bell support means 142 to contribute to the forming of the interior configuration of the pipe. When the pipe has been completed as shown in FIGURE 6, the bell former 144 is withdrawn leaving the barrel of the pipe to be supported by the supporting means 142. In order to lift the pallet, the pipe and the ring supporting element 142 it is necessary that tines or bars or some other lifting means 148 be inserted under the pallet and under the supporting means 142. Since the lower edge of supporting means 142 is aligned with the underside of the pallet 21, when the lifting tines 148 are inserted between elements 146 the tines 148 are able to lift the pallet, the supporting means 142 and the green pipe off the supporting table and to move it to the desired location.

The method is carried out by first introducing the mold elements to the pipe forming station. Thus, as with smaller pipe and where the pipe will be handled according to the disclosure of FIGURES 1 through 4, the mold elements are brought to bear or at least the jacket or two piece mold element is brought down onto the pallet. At the same time the bell former is raised to engage the jaw clutch mechanism between the core and the rotary part of the bell former. Ring 106 is forced upwardly against the seal 104 to force the seal outwardly against the aperture in the pallet. Since the two piece jacket has its jacket ring attached to frame members on the mold support frame 24 the ring 32 is held firmly against pallet 21. The main portion 52 and the bell portion 56 of the other section of the jacket slide within the confines of jacket ring 32 through a predetermined distance. Material, that is the concrete aggregate, is brought to the machine by a proper conveyor or chute means in metered amounts and introduced to the cavity between the inner and outer mold elements. At the same time compaction means, as for instance vibrators 150 attached to the jacket 52, are compacting the aggregate within the mold. While material is flowing into and being compacted in the mold cavity, the rotary part of the bell former has engaged the lower end of the core through their respective jaw clutch means and the core is caused to rotate. As mix continues to flow into the mold cavity and to be compacted, jacket 52 due to its resilient mounting is able to float vertically against the resiliency of the springs 64 so that in the event an excess of mix finds its way into the mold cavity the excess may be concentrated in the shoulder or cone area of the bell. The reason for this movement of the jacket is to give all pipes formed in the machine essentially the same length. It has been found that the floating jacket takes care of the variations in the amount of the material or aggregate metered into the mold cavity. Thus as the mold becomes full and the pipe completed it is then necessary to strip the mold elements and transfer the green pipe away from the machine.

The stripping is accomplished by the unique hold-down mechanism 50 which has hold-down ring 51 located at the lower extreme end thereof. Crosshead 40 is lowered a predetermined distance generally to place ring 51 at about the top of jacket section 52 where it begins to flare out in the form of lip 54. The hold-down 50 is brought down under pressure. In its full down position the pressure is released but the ring 51 locked. Thus pressure is neither forcing the hold-down member down nor is it forcing it upwardly. It is simply locked in position. The hold-down member can be seen to be diametrically larger than the core but smaller than the jacket so that the ring 51 itself when brought down rests upon the upper edge of the green pipe. In this way the outer and inner mold elements may be withdrawn concentrically with respect to the hold-down 50. It will be found that the jacket 52 connected to the frame elements 60 will have floated upwardly through its predetermined distance during pouring and compaction. Thus the flanges 72 of the spring containers will normally be resting against the under surface of crosshead 26. As the stripping process begins and hold-down 50 is lowered, motor 98 is reversed to disengage the clutch members and the rotary portion 116 of the bell former is given perhaps two or three revolutions in the opposite direction to effect a smooth trowel of the inside of the bell. The seal means 104 is then released from the pallet and the entire bell former assembly is withdrawn to below pallet level. As the crosshead 26 then begins to move up it immediately lifts ring 32 and at the same time begins to lift the core 58. As the crosshead continues to move upwardly, ring 32 is lifted off the pallet so that a clean stripping action of the jacket ring is accomplished. As crosshead 26 has begun to move up jacket 52 does not move until the crosshead 26 is moved upwardly to abut against the pick-up means in the form of nuts 62 at the top of frame member 60. With the hold-down ring locked in position the mold supporting frame is free to continue to move upwardly withdrawing the core 58 concentrically within hold-down element while the jacket element 52 and the jacket ring 32 are drawn up concentrically outwardly of the hold-down 50.

As soon as the hold elements have been completely stripped, and the hold-down withdrawn, the pallet supporting the green pipe is moved away from the machine on appropriate conveyor means, and at the same time, a new pallet brought into the machine and the mold elements returned to their forming positions.

The foregoing is considered as illustrative only of the principle of this invention. Numerous modifications and changes will readily occur to those skilled in the art and hence it is not desired to limit the invention to the precise construction and operation shown and described.

Accordingly all suitable modifications and equivalents may be resorted to falling within the scope of the invention.

What is claimed is:

1. An apparatus for forming concrete pipe, comprising: (a) a supporting frame structure having a pallet station therein for receiving pallets to support a mold assembly, (b) a mold assembly including an outer mold casing and an inner mold core, said casing and said core defining a pipe molding cavity and said casing and said core being dependingly supported from a crosshead member, said crosshead member in turn being slidably connected to said frame for up and down movement thereon above said pallet station, said mold assembly also including a socket forming mold member located below said pallet station, said socket forming mold member being upwardly movable from below to above a pallet to a position concentrically within the lower end of said outer mold casing, said socket forming member having a rotatable upper portion for trowelling the socket section of concrete pipe in said mold, said rotatable portion also having a clutch means engaging the lower end of said core for imparting rotation to said mold core, (c) a holddown tube member of a diameter larger than said mold core yet smaller than said mold casing, said tube member being capable of limited up and down movement and of being locked in contact position on the top end of a completed pipe in said mold assembly, (d) mold lift means attached to said crosshead member for upwardly withdrawing said mold casing and core while the completed pipe is held in place by said tube member, (e) compacting means attached to said mold assembly for facilitating settling of concrete mix introduced to said mold assembly, and (f) concrete supply means for delivering mix to said cavity in said mold assembly.

2. An apparatus for forming concrete pipe, comprising: (a) a supporting frame structure having a pallet station therein for receiving pallets to support a mold assembly, (b) a mold assembly including an outer mold casing and an inner mold core, said casing and said core defining a pipe molding cavity and said casing and said core being dependingly supported from a crosshead member, said crosshead member in turn being slidably connected to said frame for up and down movement thereon above said pallet station, said mold assembly also including a socket forming mold member located below said pallet station, said socket forming mold member being upwardly movable from below to above a pallet to a position concentrically within the lower end of said mold casing, said socket forming member having a stationary lower portion for sealingly engaging a pallet and a rotatable upper portion for trowelling the socket section of concrete pipe in said mold, said rotatable upper portion also having a clutch means for engaging the lower end of and imparting rotation to said mold core, (c) a holddown tube member of a diameter larger than said mold core yet smaller than said mold casing, said tube member being capable of limited up and down movement and of being locked in contact position on the top end of a completed pipe in said mold assembly, (d) mold lift means attached to said crosshead member for upwardly withdrawing said mold casing and core telescopically concentrically of said hold down tube member while the completed pipe is held in place by said tube member, (e) compacting means attached to said mold assembly for facilitating settling of concrete mix introduced to said mold assembly, and (f) concrete supply means for delivering mix to said cavity in said mold assembly.

3. An apparatus for forming concrete pipe, comprising: (a) a supporting frame structure having a pallet station therein for receiving apertured pallets to support a mold assembly, (b) a mold assembly including an outer mold casing and an inner mold core, said casing and said core defining a pipe molding cavity and being dependingly supported from a hangar member, said casing supported for limited floating movement, said crosshead member in turn being slidably connected to said frame for up and down movement thereon above said pallet station, said mold assembly also including a socket forming mold member located below said pallet station, said socket forming mold member being upwardly movable from below to partially above a pallet to a position concentrically within the lower end of said outer mold casing, said socket forming member having a rotatable upper portion for trowelling the bell section of concrete pipe in said mold, said rotatable portion also having a clutch means for engaging the lower end of and imparting rotation to said mold core, said socket forming member having a stationary lower portion including sealing means for engaging a pallet, (c) a holddown tube member of a diameter larger than said mold core yet smaller than said mold casing, said tube member being capable of limited up and down movement and of being locked in contact position on the top end of a completed pipe in said mold assembly, (d) mold lift means attached to said crosshead member for upwardly withdrawing said mold casing and core while the molded pipe is held in place by said tube member, (e) compacting means attached to said mold assembly for facilitating settling of concrete mix introduced to said mold assembly, and (f) concrete supply means for delivering mix to said cavity in said mold assembly.

4. An apparatus for forming concrete pipe, comprising: (a) a supporting frame structure having a pipe pallet supporting station therein, (b) an outer mold casing and an inner mold core both dependingly supported from a generally horizontal cross member, said cross member in turn being connected to said frame for up and down movement thereon above said pallet station, (c) a socket forming mold member located below said pallet station, said socket forming mold member being upwardly movable from below said pallet station to a position concentrically within the lower end of said outer mold casing, said socket forming member having a stationary lower portion with sealing means for sealingly engaging a pallet and a rotatable upper portion for trowelling concrete pipe in said mold, said rotatable upper portion also having a clutch means for engaging the lower end of and rotating said mold core, (d) a hold-down tube member of a diameter larger than said mold core yet smaller than said mold casing, said tube member being capable of limited up and down movement and of being locked in contact position on the top end of a completed pipe in said mold assembly, (e) mold lift means attached to said cross member for upwardly withdrawing said mold casing and core telescopically and concentrically of said tube member while the molded pipe is held in place by said tube member, (f) compacting means attached to said mold assembly for facilitating settling of concrete mix introduced to said mold assembly, and (g) concrete supply means for delivering mix to said mold assembly.

5. An apparatus for forming concrete pipe, comprising: (a) a supporting frame structure having a pallet station therein for receiving pallets to support a molded pipe, (b) a mold assembly including a two piece outer mold casing and an inner mold core, said casing and said core defining a pipe molding cavity and said casing and said core being dependingly supported from a mold frame structure, said mold frame in turn being slidably connected to said supporting frame for up and down movement thereon above said pallet station, said mold assembly also including a socket forming mold member located below said pallet station, said socket forming mold member being upwardly movable from below to above a pallet to a position concentrically within the lower end of said outer mold casing, said socket forming member being rotatable for trowelling the socket section of concrete pipe in said mold, (c) a hold-down tube member of a diameter larger than said mold core yet smaller than said mold casing, said tube member being capable of limited

up and down movement and of being locked in contact position atop the upper end of a completed pipe in said mold assembly, (d) mold lift means attached to said mold frame for upwardly withdrawing said mold casing and core while the molded pipe is held in place by said tube member, (e) compacting means attached to said mold assembly for facilitating settling of concrete mix introduced to said mold assembly, and (f) concrete supply means for delivering mix to said cavity in said mold assembly.

6. An apparatus for forming concrete pipe, comprising: (a) a supporting frame structure having a pallet station therein for receiving pallets to support a mold assembly, (b) a mold assembly including a two-piece outer mold jacket and an inner mold core, said jacket and said core defining a pipe molding cavity and said jacket and said core being dependingly supported from a mold frame structure, said mold frame in turn being slidably connected to said frame for up and down movement thereon above said pallet station, said two-piece jacket including a generally elongated, main jacket section resiliently mounted on said mold frame for floating movement through a predetermined distance and also including a lower bell ring section rigidly supported on and by said mold frame for slidably receiving the lower end of said main jacket section, said mold assembly also including a rotatable socket-forming mold member located below said pallet station, said socket-forming mold member being upwardly movable from below to above a pallet to a position concentrically within the lower end of said mold jacket, (c) a hold-down tube member of a diameter larger than said mold core yet smaller than said mold jacket, said tube member being capable of limited up and down movement and of being locked in contact position atop the upper end of a completed pipe in said mold assembly, (d) mold lift means attached to said mold frame for upwardly withdrawing said mold jacket and core telescopically concentrically of said tube member while the molded pipe is held in place by said tube member, (e) compacting means attached to said mold assembly for facilitating settling of concrete mix introduced to said mold assembly, and (f) concrete supply means for delivering mix to said cavity in said mold assembly.

7. An apparatus for forming concrete pipe, comprising: (a) a supporting frame structure having a pallet station therein for receiving apertured pallets to support a mold assembly, (b) a mold assembly including a two-piece mold jacket and an inner mold core, said jacket and said core defining a pipe molding cavity and being dependingly supported from a mold frame structure, in said supporting frame said two-piece jacket including a generally elongated main jacket section resiliently mounted on said mold frame for floating movement through a predetermined distance and also including a lower bell ring section rigidly supported on and by said mold frame for slidably receiving the lower end of said main jacket section, said mold assembly also including a socket-forming mold member located below said pallet station, said socket-forming mold member being upwardly movable from below to partially above a pallet to a position concentrically within the lower end of said outer mold jacket, said socket-forming member having a rotatable upper portion for trowelling the socket section of concrete pipe in said mold, said rotatable portion also having a clutch means for engaging the lower end of and imparting rotation to said mold core, (c) a hold down tube member of a diameter larger than said mold core yet smaller than said mold jacket, said tube member being capable of limited up and down movement and of being locked in contact position atop the upper end of a completed pipe in said mold assembly, (d) mold lift means attached to said hangar member for upwardly withdrawing said mold jacket and core while the molded pipe is held in place by said tube member, (e) compacting means attached to said mold assembly for facilitating settling of concrete mix introduced to said mold assembly and (f) concrete supply means for delivering mix to said cavity in said mold assembly.

8. An apparatus for forming belled concrete pipe, comprising: (a) a supporting frame structure having a mold pallet supporting station therein, (b) an outer two-piece mold jacket and an inner mold core both dependingly supported from a mold frame structure, said mold frame in turn being connected to said frame for up and down movement thereon above said pallet station, said two-piece jacket including a generally elongated main jacket section resiliently mounted on said mold frame for floating movement through a predetermined distance and also including a lower bell ring section rigidly supported on and by said mold frame for slidably receiving the lower end of said main jacket section, (c) a socket-forming mold member located below said pallet station, said socket-forming mold member being upwardly movable from below said pallet station to a position concentrically within the lower end of said outer mold jacket said socket-forming member having a stationary lower portion with sealing means for sealingly engaging a pallet and a rotatable upper portion for trowelling concrete pipe in said mold, said rotatable upper portion also having a clutch means for engaging the lower end of and rotating said mold core, (d) a hold-down tube member of a diameter larger than said mold core yet smaller than said mold casing, said tube member being capable of limited up and down movement and of being locked in contact position atop the upper end of a completed pipe in said mold assembly, (e) mold lift means attached to said mold frame for upwardly withdrawing said mold jacket and core telescopically concentrically of said tube member while the molded pipe is held in place by said tube member, (f) compacting means attach to said mold assembly for facilitating settling of concrete mix introduced to said mold assembly, and (g) concrete supply means for delivering mix to said mold assembly.

9. An apparatus for forming concrete pipe, comprising: (a) a supporting frame structure having a mold pallet supporting station therein, (b) an outer two-piece mold jacket and an inner mold core both dependingly supported from a mold frame structure slidably supported on said supporting frame, said two-piece jacket including a generally elongated main jacket section resiliently mounted on said mold frame for floating movement through a predetermined distance and also including a lower bell ring section rigidly supported on and by said mold frame for slidably receiving the lower end of said main jacket section, (c) a socket-forming mold member located below said pallet station, said socket-forming mold member being upwardly movable from below said pallet station to a position concentrically within the lower end of said outer mold jacket, said socket forming member having a rotatable portion for trowelling concrete pipe in said mold, said rotatable portion also having a clutch means for engaging the lower end of and rotating said mold core, (d) a hold-down tube member of a diameter larger than said mold core yet smaller than said mold casing, said tube member being capable of limited up and down movement and of being locked in contact position atop the upper end of a completed pipe in said mold assembly, (e) mold lift means attached to said mold frame for upwardly withdrawing said mold casing and core telescopically concentrically relative said tube member while the molded pipe is held in place by said tube member, (f) compacting means attached to said mold assembly for facilitating settling of concrete mix introduced to said mold assembly, and (g) concrete supply means for delivering mix to said mold assembly.

10. An apparatus for forming concrete pipe, comprising: (a) a supporting frame structure having a pallet station therein for receiving pallets to support a mold as-

sembly, (b) a mold assembly including a two-piece outer mold jacket and an inner mold core, said jacket and said core defining a pipe molding cavity and said jacket and said core being dependingly supported from a mold frame structure, said mold frame in turn being slidably connected to said frame for up and down movement thereon above said pallet station, said two-piece jacket including a generally elongated, main jacket section resiliently mounted on said mold frame for floating movement through a predetermined distance and also including a lower bell ring section rigidly supported on and by said mold frame for slidably receiving the lower end of said main jacket section, said mold assembly also including a rotatable socket-forming mold member located below said pallet station, said socket-forming mold member being upwardly movable from below to above a pallet to a position concentrically within the lower end of said mold jacket, (c) a hold-down tube member of a diameter larger than said mold core yet smaller than said mold jacket, said tube member being capable of limited up and down movement and of being locked in contact position atop the upper end of a completed pipe in said mold assembly, (d) mold lift means attached to said mold frame for upwardly withdrawing said mold jacket and core telescopically concentrically of said tube member while the molded pipe is held in place by said tube member, (e) compacting means attached to said mold assembly for facilitating settling of concrete mix introduced to said mold assembly, and (f) concrete supply means for delivering mix to said cavity in said mold assembly, and (g) an annular T-shaped support means for supporting the barrel portion of said pipe.

11. An apparatus for forming concrete pipe, comprising: (a) a supporting frame structure having a pallet station therein for receiving apertured pallets to support a mold assembly, (b) a mold assembly including a two-piece mold jacket and an inner mold core, said jacket and said core defining a pipe molding cavity and being dependingly supported from a mold frame structure, in said supporting frame said two-piece jacket including a generally elongated main jacket section resiliently mounted on said mold frame for floating movement through a

predetermined distance and also including a lower bell ring section rigidly supported on and by said mold frame for slidably receiving the lower end of said main jacket section, said mold assembly also including a socket-forming mold member located below said pallet station, said socket-forming mold member being upwardly movable from below to partially above a pallet to a position concentrically within the lower end of said outer mold jacket, said socket-forming member having a rotatable upper portion for trowelling the socket section of concrete pipe in said mold, said rotatable portion also having a clutch means for engaging the lower end of and imparting rotation to said mold core, (c) a hold-down tube member of a diameter larger than said mold core yet smaller than said mold jacket, said tube member being capable of limited up and down movement and of being locked in contact position atop the upper end of completed pipe in said mold assembly, (d) mold lift means attached to said hangar member for upwardlly withdrawing said mold jacket and core while the molded pipe is held in place by said tube member, (e) compacting means attached to said mold assembly for facilitating settling of concrete mix introduced to said mold assembly, (f) concrete supply means for delivering mix to said cavity in said mold assembly, and (g) an annular T-shaped support means for supporting the barrel portion of said pipe.

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