Nov. 1, 1966 H. G. ROBINSON 3,281,910

CONCRETE MOLDING APPARATUS WITH ALIGNMENT MEANS

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Fig. 1

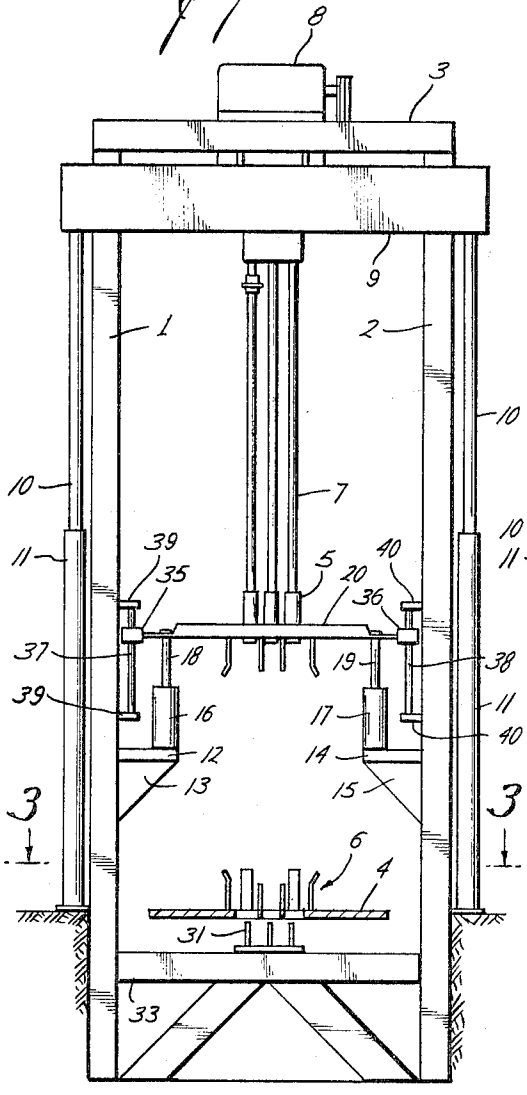
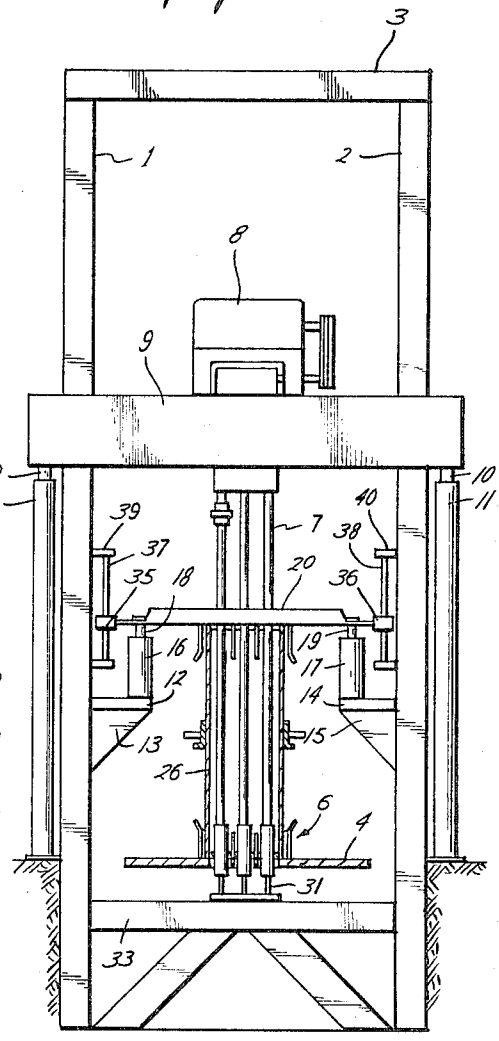


Fig. 2



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Fig. 3

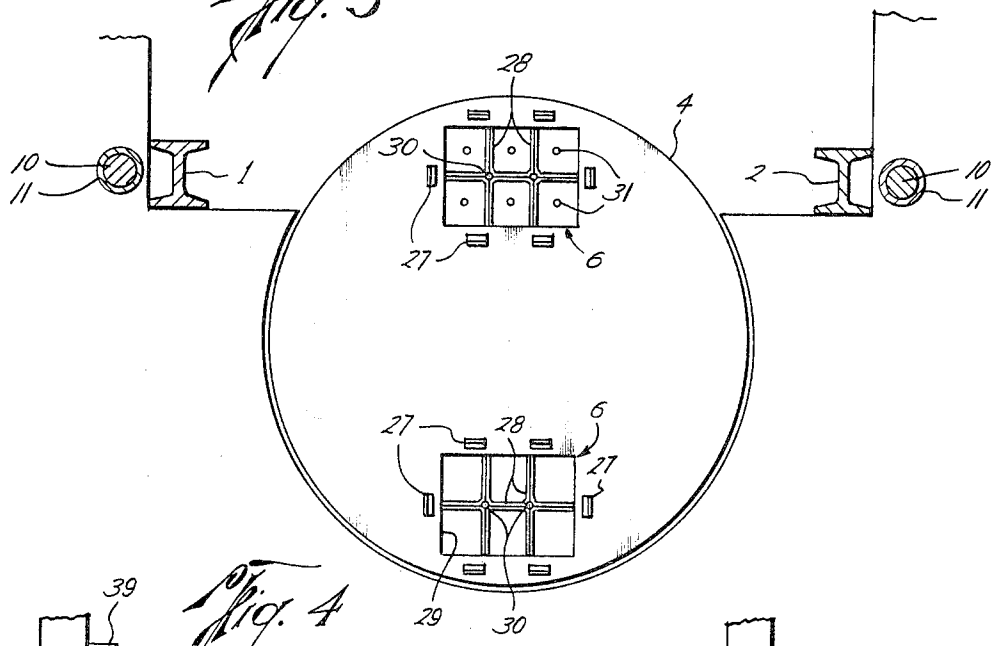
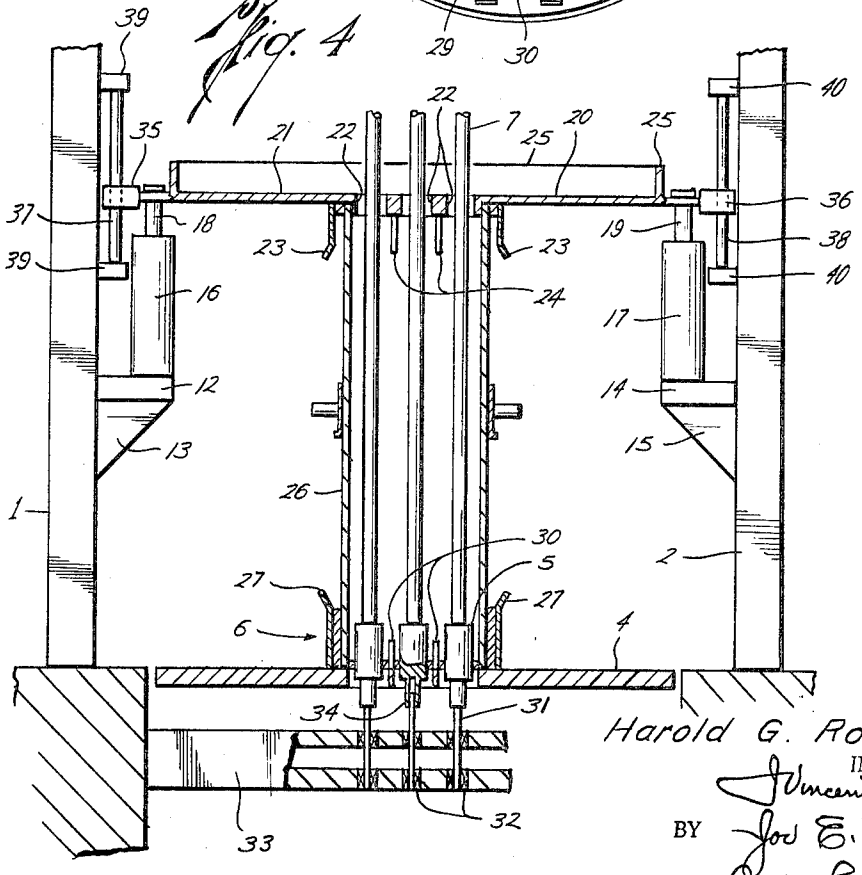


Fig. 4



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CONCRETE MOLDING APPARATUS WITH ALIGNMENT MEANS

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The present invention relates generally to forming concrete conduit and other formed concrete structures. Specifically the present invention relates to a machine for mold forming of concrete structures.

Concrete conduit is generally made by packing a concrete mixture within a rectangular-shaped mold having rounded, beveled, or a combination of rounded and beveled corners and in lengths of forty-two inches more or less. Such conduit will have a plurality of holes extending through its length. In use such conduit is butted against other concrete conduit with electric cable and wires extending through the holes. It is therefore important that all of the holes be completely straight and uniformly positioned. Also, the conduits are usually positioned with respect to each other by dowel pins which extend into holes in the conduits that are made during the packing of the conduit. It is clear that each conduit must therefore be identical with each other conduit within reasonable tolerances in order to properly contain electric cable and wires without danger of a pinching of the wires due to misalignment of the holes or to the holes being formed other than straight. Alignment of the packer heads during the forming of the holes is therefore of utmost importance. The point at which most such problems have arisen is the point at which the packer heads begin their upward travel because of the great length of their spindles which is necessary because of the length of the concrete conduit being formed. The packing is accomplished normally by the rotation of the packing heads and such rotation of a long shaft can create whipping which will create an imperfect hole unless it is eliminated by proper alignment support of the packer heads.

The primary object of the present invention is to provide an improved apparatus for forming concrete structures such as concrete conduit in which the concrete mix is packed and at the same time uniform straight holes are formed in the structure by the packing devices.

Another object of the present invention is to provide an improved apparatus for forming packed concrete structures in which the packer heads are provided with alignment pins which assure alignment during the initial movement of the packer heads.

Still another object of the present invention is to provide an improved apparatus for forming packed concrete structures having separate controls for the movement of the packers and the combined top mold closure and material tray.

A further object of the present invention is to provide an improved apparatus for forming packed concrete structures having a rotating table with at least two mold-receiving sections on which molds are mounted whereby while one mold is being packed a previously packed mold may be removed and an empty mold set in place to be ready for receiving concrete when the mold being packed is completed.

A still further object of the present invention is to provide an improved apparatus for forming packed concrete structures having a rotating table on which at least two sets of mold-receiving guides are mounted and one set of packer alignment pins are positioned below the rotating table to engage the packers during their initial travel in the packing of the concrete within the mold.

These and other objects of the present invention are hereinafter more fully explained and described in reference to the drawings wherein:

FIGURE 1 is a front elevation view partially in section of the apparatus of the present invention illustrating the position of the apparatus with the packer heads and combined top mold closure and material tray in their retracted position.

FIGURE 2 is a similar front elevation view of the apparatus of the present invention illustrating the position of the apparatus with respect to the mold wherein the packer heads and combined top mold closure and material tray are positioned in their extended position.

FIGURE 3 is a sectional view of the apparatus shown in FIGURE 1 taken along lines 3—3 in FIGURE 1.

FIGURE 4 is an enlarged partial elevation view of the apparatus shown in FIGURE 2.

In the figures the apparatus of the present invention includes I-beams 1 and 2 providing vertical support and joined at their upper ends by brace 3. As best shown in FIGURE 3, I-beams 1 and 2 straddle a portion of rotating table 4 to position packer heads 5 directly over one of the mold-receiving sections 6 in table 4. Packer heads 5, their spindles 7 and a suitable power source such as motor 8 are supported by cross brace 9 which is actuated by the movement of pistons 10 responsive to pressure in cylinders 11. It is suggested that some sliding connection be established between cross brace 9 and I-beams 1 and 2 or that cylinders 11 be suitably supported so that the movement of cross brace 9, spindles 7 and packer heads 5 will be vertical, even though no such connection or support is shown in the drawings. Pistons 10 and cylinders 11 should be designed to provide sufficient travel of packing heads 5 from their fully retracted position as shown in FIGURE 1 to their fully extended position as shown in FIGURES 2 and 4.

Even though not shown, rotating table 4 is to be provided with suitable rotating support. It is further suggested that some means be provided for the movement of rotating table 4 and to properly position mold-receiving sections 6 directly under packing heads 5. Such movement of table 4 may be manual or motor driven without departing from the scope of the present invention.

Shelf 12 is attached to I-beam 1 and is supported by bracket 13. Shelf 14 is similarly attached to I-beam 2 and is supported by bracket 15. Cylinders 16 and 17 are positioned on shelves 12 and 14 respectively and extend upward with their respective arms 18 and 19 engaging combined top mold closure and material tray 20, hereinafter referred to as tray 20.

Tray 20 includes plate 21 which extends substantially horizontally and is provided with central openings 22 for admitting packer heads 5, depending mold guides 23, depending dowel pins 24 and upstanding lip 25. Cylinders 16 and 17 should be designed to provide sufficient travel of tray 20 to its upper position at which mold 26 may be moved under depending mold guides 23, and have some remaining travel at their lower position for tightly engaging the upper portion of mold 26.

Mounted at each side of tray 20 are bushings 35 and 36 which surround guide rods 37 and 38 respectively in sliding engagement. Guide rods 37 and 38 are secured on I-beams 1 and 2 by brackets 39 and 40 and are mounted vertically to assure a vertical movement of tray 20.

As shown in FIGURE 4, mold 26 is tightly positioned in mold-receiving sections 6 of table 4. Guides 27 extend upward from table 4 and flare outward at their upper extremity as shown. As shown in FIGURE 3 sections 6

include structures 28 extending across the rectangular holes 29 in table 4 to support dowel pins 30 which extend upwardly therefrom and terminate at a level below the top of guides 27. Structures 28 do not extend above table 4 and are shown to be flat plates suitably secured within holes 29 as by welding. Any suitable support for dowel pins 30 may be used which provides adequate support, is below the top of table 4, and will allow packer heads 5 to extend into their lower position. As shown in the drawings the sections 6 would receive a mold 26 which was to be substantially rectangular in shape, except for rounded corners, and would be used to form a concrete conduit having the same general exterior shape as the interior of mold 26, and having one or mole holes extending vertically therethrough. Alignment pins 31 are mounted in bearings 32 below table 4 and bearings 32 are suitably supported on lower cross brase 33 between I-beams 1 and 2. Each packer head 5 is provided with an alignment pin 31 which is positioned in axial alignment with its respective packer head 5 and engages into socket 34 provided in each packer head 5 when the packer heads 5 are fully extended. Such engagement is clearly shown in FIGURE 4.

In operation, an empty mold 26 will be positioned on the mold-receiving section 6 which is not positioned under packer heads 5. It will be guided into position by guides 27. Normally molds 26 will be provided with a bottom or pallet which has suitable holes for receiving packer heads 5 and the dowel pins 30, and will contain the concrete which is to be packed into mold 26. When mold 26 is properly positioned in mold-receiving section 6 of table 4, table 4 will be turned to position mold 26 directly below packer heads 5. In this position tray 20 and packer heads 5 are independently lowered into the position shown in FIGURES 2 and 4 by actuating cylinders 11 to lower packer heads 5, 16 and 17 to lower tray 20. The lowering of tray 20 will cause the upper portion of mold 26 to be engaged by depending guides 23 and will properly position mold 26 with respect to tray 20. When tray 20 and packer heads 5 are positioned fully down then a relatively dry concrete mixture is placed on tray 20 by a motor driven conveyor (not shown) and pushed into the interior of mold 26 around spindles 7 and packer heads 5. With mold 26 substantially full of concrete, packer heads 5 are rotated by motor 8. Since all of packer heads 5 are to be rotated in the same direction, suitable gearing connections (not shown) should be provided between motor 8 and spindles 7 to provide such rotation of packer heads 5. As packer heads 5 commence rotating, they are supported axially by alignment pins 31. Such support prevents any whipping of spindles 7 and the packer heads 5 due to the length of spindles 7. Packer heads 5 are of a suitable design that will provide a compacting or packing of the concrete mixture as they are rotated and lifted upward through mold 26. The lifting of packer heads 5 through mold 26 is accomplished by actuation of cylinders 11 which cause pistons 10 to move upward thereby lifting cross brace 9, motor 8, spindles 7 and packer heads 5. After packer heads have started to rise, they will disengage from alignment pins 31. Further alignment support will not be required as the concrete which has been packed in the lower portion of mold 26 prior to such disengagement will provide the necessary axial support and maintain alignment in the upward movement of packer heads 5.

It should be noted that sufficient material will be placed in mold 26 initially for forming a complete concrete conduit by virtue of the difference in volume occupied by spindles 7 as compared to the volume of the holes made by the upward movement of packer heads 5 in relation to the compaction of the concrete mixture which is achieved by packer heads 5.

When packer heads 5 have completed their upward travel through mold 26, the concrete will be completely packed therein and a plurality of straight holes will extend through such packed concrete. The completion of the packing is followed by a further lifting of packer heads 5 by cylinders 11 and pistons 10 and by an independent lifting of tray 20 by cylinders 16 and 17 to the position shown in FIGURE 1. Tray 20 must be lifted a sufficient distance above the upper end of mold 26 to allow table 4 to be rotated and provide clearance between depending guides 23, dowel pins 24 and the upper end of mold 26. At this time the molding is completed and table 4 is rotated to position an empty mold 26 in position under packer heads 5. The packed mold 26 will then be positioned at the opposite side of table 4 and may easily be removed therefrom with a suitable lifting device and another empty mold 26 will be set in place of the finished mold 26 which has been removed. The completed mold 26 will be taken to suitable curing space until it may be removed from the concrete conduit which it contains without deforming or affecting the shape or strength of such concrete conduit.

It is suggested that the straight portions of guides 27 be longer than dowel pins 30 to prevent damage to the holes in the formed concrete conduit within mold 26 by dowel pins 30 and assure a straight vertical lift of completed mold 26 from mold-receiving section 6.

From the foregoing it may be seen that an apparatus for forming concrete structures has been provided which maintains axial alignment of the packing heads at the beginning of their travel upward through the structure being molded, rotates the completed mold from the packing area and a fresh mold into the packing area, and moves the packer heads and tray independently of each other.

The foregoing disclosure and description of the invention is illustrative and explanatory thereof and various changes in the size, shape, and materials, as well as in the details of the illustrated construction, may be made within the scope of the appended claims without departing from the spirit of the invention.

What is claimed is:

1. An apparatus for forming molded concrete structures comprising,
   - a plurality of packer heads,
   - means for rotating said packer heads,
   - means moving said packer heads vertically,
   - a mold-receiving section positioned in a plane below said packer heads,
   - a hollow mold supported upon said mold-receiving section,
   - fixed dowel pins extending upwardly from said mold-receiving section and extending into the lower end of the mold when said mold is in position on said mold-receiving section,
   - guide means secured to the mold-receiving section, and surrounding the lower portion of the mold so as to extend upwardly along the exterior surface thereof to guide movement of the mold in a true axial direction when said mold is raised upwardly after the molding operation has been completed.
   - said guide means projecting upwardly to a plane above said dowel pins, whereby axial guiding of the movement of the mold is assured throughout the disengagement of said dowel pins from the material within the mold when said mold is raised, and
   - alignment means adapted for engagement with said packer heads in their lowermost position whereby said packer heads are maintained in alignment during initial packing.

2. An apparatus for forming molded concrete structures according to claim 1 wherein said alignment means include alignment pins rotatively mounted whereby wear and consequent misalignment resulting therefrom is minimized.

3. An apparatus for forming molded concrete structures according to claim 1 including,
   - a mold closure tray adapted to engage the top of said mold,
   - dowel pins depending from said mold closure tray and extending into the upper end of said mold when said

mold closure tray is positioned on the top of said mold, and

guide means depending from said mold closure tray to a plane below said dowel pins on said mold closure tray whereby said mold is retained in position during molding operations and upward movement of said mold closure tray is guided to assure the axial disengagement of said dowel pins from the molded structure in the mold.

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