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APPARATUS FOR MANUFACTURING PRETENSIONED, REINFORCED  
CONCRETE SECTIONS

**2,962,785**

Filed Aug. 18, 1955

2 Sheets-Sheet 1

FIG.1.

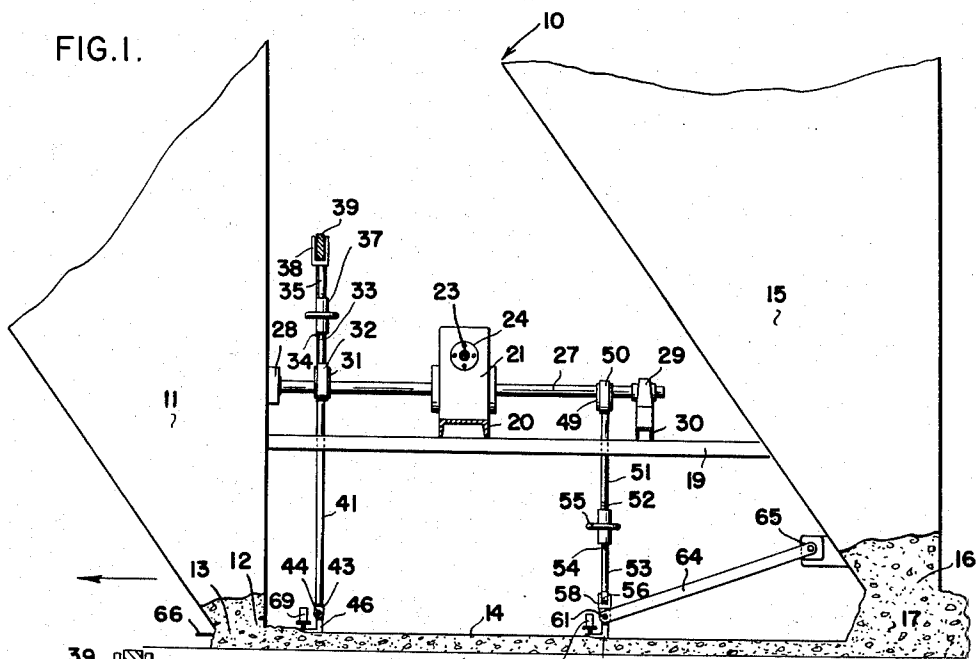
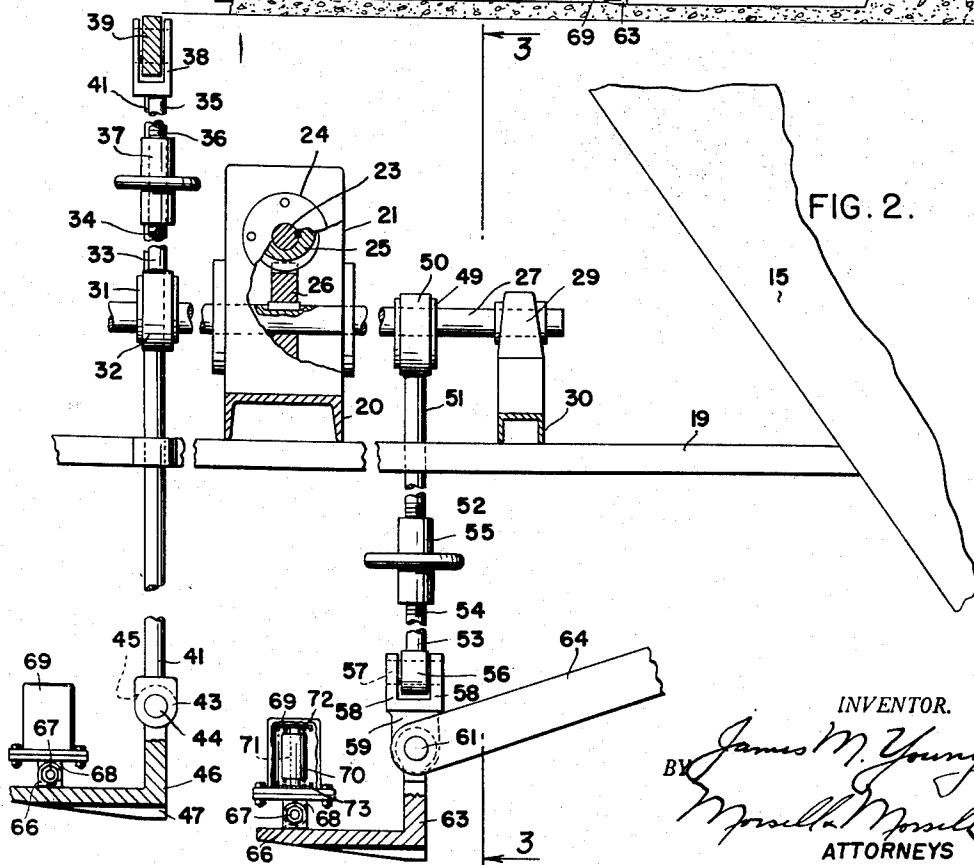


FIG. 2.



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FIG. 3.

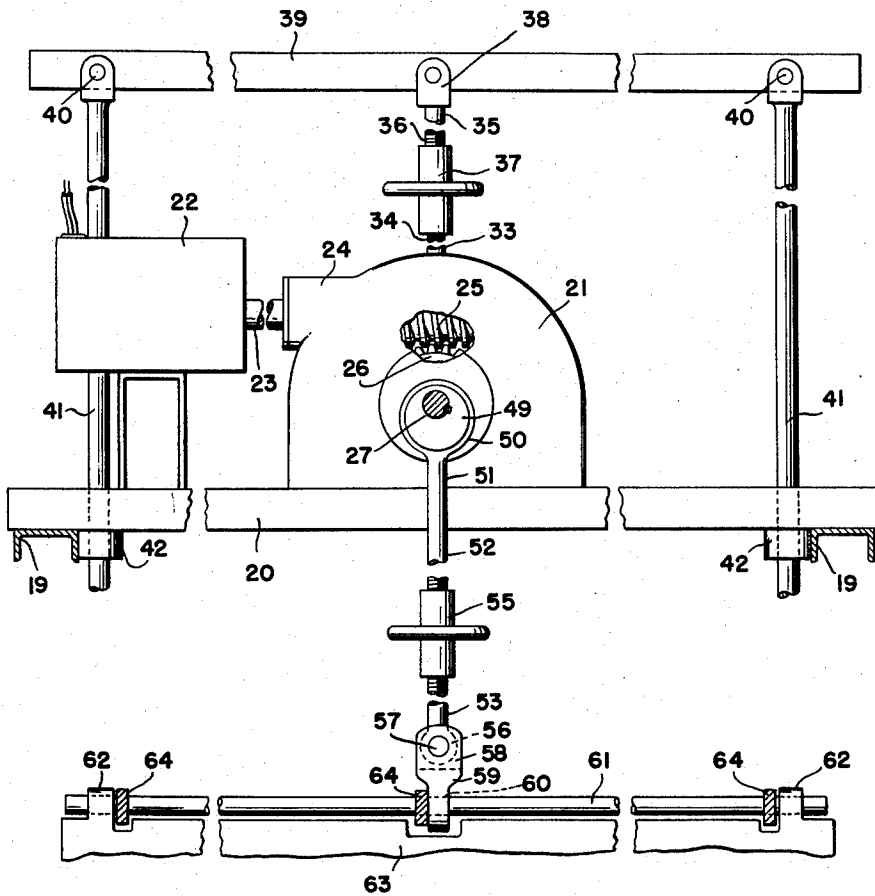


FIG. 4.

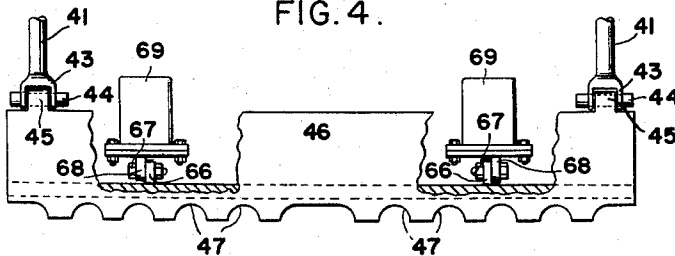
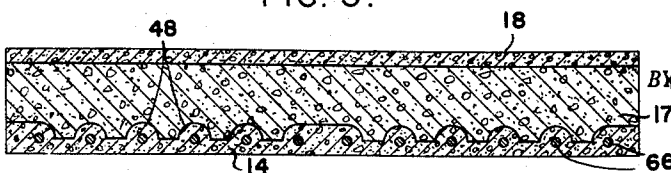


FIG. 5.



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## APPARATUS FOR MANUFACTURING PRETENSIONED, REINFORCED CONCRETE SECTIONS

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3 Claims. (Cl. 25—1)

This invention relates to improvements in apparatus for manufacturing pre-tensioned, reinforced concrete sections.

In the manufacture of concrete sections, such as elongated pre-tensioned concrete planks, it is important to obtain a high quality concrete and a good compaction around the tensioned reinforcing wires. These reinforcing wires are usually embedded in the layer of concrete which is poured first, and prior to the pouring of any other layers it is important that the concrete be properly compacted around the wires. This pre-stressed lower layer of a concrete plank is the most important component if the plank is used as a structural member such as for rough flooring or roofing. Heretofore machines for manufacturing concrete sections have failed to provide for a proper compaction of the bottom layer.

It is a general object of the present invention to provide, in an apparatus for manufacturing concrete sections, improved means for compacting the first poured layer of concrete around the reinforcing wires to thereby greatly improve the quality of the final product.

A further object of the invention is to provide in an apparatus as above described, means for creating rapid vibrations whereby fluent portions of the concrete may be caused to flow into all of the voids and whereby particles of sand or aggregate may find their most compact position alongside one another.

A further object of the invention is to provide in an apparatus of the class described, a pair of tamping members, both operable on the first poured layer of concrete, the front tamper being adapted to preliminarily tamp the freshly poured layer, and the rear tamper being adapted to effect a final compaction of the concrete around the tensioned reinforcing wire.

A further object of the invention is to provide in an apparatus as above described vibrating mechanism connected to each tamping member which mechanism may be used independently of or in conjunction with the tamping action.

A still further object of the invention is to provide a device as above described wherein the vibrators are detachably connected to the shoes of the tamping members.

A further object of the invention is to provide in a device as above described, means whereby the front and rear tampers may be independently adjusted to bring about an accurate control of density and other factors which affect the quality of the final product.

A still further object of the invention is to provide an apparatus as above described having improved mechanism for driving the tampers.

With the above and other objects in view, the invention consists of the improved apparatus for manufacturing concrete sections, and all of its parts and combinations, as set forth in the claims, and all equivalents thereof.

In the accompanying drawing, in which the same reference numerals designate the same parts in all of the views:

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Fig. 1 is a fragmentary side elevational view of an apparatus for manufacturing elongated concrete sections, such as concrete planks, illustrating the tampers for tamping and compacting the first poured layer of concrete;

Fig. 2 is an enlarged side elevational view of the tamping and compacting mechanism, parts being broken away to foreshorten the view, and other parts being broken away and shown in section;

Fig. 3 is a sectional view taken on the line 3—3 of Fig. 2, parts being broken away;

Fig. 4 is a fragmentary elevational view looking at the rear of the front tamping member; and

Fig. 5 is a transverse sectional view through a complete concrete plank.

Referring more particularly to the drawing, the numeral 10 designates generally an apparatus for manufacturing elongated pretensioned, reinforced concrete sections such as concrete planks, said apparatus including a bin 11 having a bottom opening 12. The bin is adapted to contain a concrete producing mixture 13 of high quality, said mixture including aggregate and cementing material. This mixture is adapted to form the bottom layer 14 of a concrete plank, such as the plank shown in cross section in Fig. 5.

The apparatus also includes another bin 15 having a bottom opening 16. The bin 15 is adapted to contain a mixture containing a light-weight aggregate for forming the middle layer 17 (see Fig. 5). There may also be a third bin, not shown, for depositing a top or finishing layer of suitable quality concrete such as the layer 18 of Fig. 5. The present invention is concerned with the apparatus for tamping, vibrating and compacting the bottom layer 14.

As is well known in apparatus of this type, the apparatus 10 may be suitably mounted for movement in the direction indicated by the arrow in Fig. 1, so that an elongated section such as a plank may be progressively poured as the apparatus is moved.

Referring more particularly to the improved tamping and compacting apparatus, there may be suitable supports, preferably in the form of inverted channels 19 which extend between the bins 11 and 15. Extending transversely of the supports 19 is a suitable support such as an inverted channel 20 on which a gear box 21 is mounted. An electric motor 22, which may also be supported on the channel 20, is adapted to drive a shaft 23 which extends into the gear box through a suitable bearing 24. Mounted rigidly on the shaft 23 is a worm 25 which meshes with a wormwheel 26 mounted rigidly on a shaft 27. The shaft 27 is journaled for rotation in bearings 28 and 29, the latter being supported on a transverse channel 30 which is in turn supported on the channels 19.

Keyed to the shaft 27, in front of the gear box 21, is an eccentric disc 31 which is rotatable within a ring 32. Projecting upwardly from the ring 32 is a rod section 33 having threading 34 thereon. The rod section 33 is connected to an upper rod section 35, having threading 36, by means of a manually operable turnbuckle 37. The upper end of the rod section 35 is connected by a clevis 38 with a horizontal support 39.

Depending from each end of the horizontal support 39 and pivotally connected thereto as at 40 are rods 41. The latter are guided for slidable movement in bearing members 42 which may be supported on the channels 19. The lower ends of the rods 41 are formed with clevises 43 which are pivotally connected by pins 44 with upwardly projecting eyed lugs 45 of a front tamping member 46, as shown in Fig. 4.

It will be noted from Fig. 2 that the tamping member

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46 is L-shaped in cross section and that its bottom is formed with spaced, transverse, inverted U-shaped recesses 47 which are adapted to produce convex ribs 48 on the bottom layer of concrete, as shown in Fig. 5.

Also keyed to the shaft 27, behind the gear box 21, is another eccentric disc 49 which is rotatable within a ring 50. The eccentric 49 is preferably disposed so that it projects oppositely from the eccentric disc 31. Depending from the ring 50 is a rod section 51 having a threaded portion 52. Another rod section 53, which is threaded as at 54, is connected by a manually operable turnbuckle 55 with the rod section 51. The lower end of the rod section 53 is in the form of an eye 56, and the latter is connected by a pin 57 between the spaced ears 58 of a connection member 59. The lower end of the member 59 has an opening 60 through which a rod 61 extends. The outer ends of the rod 61 extend rotatably through openings in upwardly projecting lugs 62 of a rear tamping member 63. The bottom of the rear tamping member 63 has the same shape as is shown in Fig. 4 for the bottom of the front tamping member 46.

The rod 61 also extends rotatably through openings in the forward ends of guide arms 64. The rearward ends of said guide arms are pivoted to the bin 15 as at 65 to thereby brace the rear tamping member while permitting up and down reciprocating movement.

Projecting upwardly from each of the tamping shoes 46 and 63 are spaced apertured lugs 66, as shown in Figs. 2 and 4. These lugs are detachably connected by nuts and bolts 67 with apertured lugs 68 which depend from vibrators 69. Each vibrator may be of any suitable type. It is preferred, however, to use a vibrator of the general type illustrated on the shoe 63 of Fig. 2. This type of vibrator may include a weight 70 slidable vertically on a rod 71 under the influence of the changing magnetic poles 72 and 73. The vibrators may be electrically energized in any suitable manner. One vibrator of a suitable type is known as the "Cleveland" vibrator. These vibrators are capable of producing between 1800 and 3600 vibrations per minute.

#### Operation

In use of the improved apparatus, as the machine moves along in the direction of the arrow of Fig. 1, a concrete forming mixture from the bin 13 is discharged from the bottom opening 12 to pour the bottommost layer 14 of a concrete plank such as the plank shown in Fig. 5. This layer is poured over pre-tensioned steel reinforcing wires 66 as is clear from Figs. 1 and 5. With the electric motor 22 in operation, the shaft 27 is rotated to cause an up and down reciprocating movement to be imparted to the upwardly projecting rods 33-35. Through the upper horizontal member 39, this causes an up and down movement of the depending rods 41. Inasmuch as the rods are attached to the front tamper 46, the latter moves up and down to tamp the surface of the concrete and form it in accordance with the pattern 47 shown at the bottom of Fig. 4.

At the same time, the rear tamper 63, which is in an opposite phase, is being reciprocated. Normally, the turnbuckle 55 for the rear tamper is adjusted so that the rear tamper, when in its lowermost position, is somewhat lower than the front tamper when the latter is in its lowermost position. Thus a final compaction is obtained by the operation of the rear tamper, and the amount of compaction may be controlled by the adjustment of the member 55. It is thus apparent that a very good compaction can be obtained around the pre-tensioned reinforcing wires 66, and that this accurately controlled tamping and compaction, which is independent of tampers for any of the other layers, produces a very high quality concrete in the bottom layer which concrete is prestressed by being formed around the wires. Unless the concrete is of high quality, prestressing cannot be successfully accomplished. As a result of the present

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apparatus, which gives accurate control over the density and quality of the bottom layer, the finished plank of Fig. 4 is capable of withstanding all of the stresses to which it may be subjected when used as a roofing or flooring member in a building.

While the tampers may be used as above described, without vibrators to produce good results when working with certain materials, nevertheless it is very advantageous when working with certain other types of materials to employ the vibrating action. When the vibrators are not to be used, the bolts 67 may be removed and the vibrators detached, or if preferred, the vibrators may be left in connected condition, but not energized.

If the vibrators are to be employed, they may be used either in addition to the tamping action, or independently thereof. When vibration is to be used alone, without tamping, then the shoes are adjusted to about the same level with, however, the front shoe 46 slightly higher. The shoes are then kept in this position and the vibrators are operated. When working with certain types of material, usually for the bottom layer 14, the rapid vibrations cause the fluent portions of the concrete to flow into all of the voids and tend to cause particles of sand or aggregate to find their most compact position alongside one another. Thus a very refined control of compaction may be obtained to increase the quality of the resulting product.

Various changes and modifications may be made without departing from the spirit of the invention, and all of such changes are contemplated as may come within the scope of the claims.

What I claim is:

1. In an apparatus for manufacturing concrete sections and having a movable bin for progressively discharging a layer of concrete, a shaft rotatably supported behind said bin for movement therewith, means for rotating said shaft, said shaft projecting rearwardly in the line of movement of the bin, a first eccentric disc on said shaft, a ring within which said disc is rotatable, a first tamping member positioned to engage the concrete layer, push rods projecting upwardly from said tamping member, a cross member connecting said push rods above said rotatable shaft, means between said ring and cross member for causing up and down movement of the cross member when said shaft is rotated, a second eccentric disc on said shaft behind the first disc, a ring within which said second disc is rotatable, a second tamping member positioned to engage the concrete layer behind the first tamping member, and an upwardly projecting actuating connection between said second tamping member and the ring which surrounds said second eccentric disc.

2. In an apparatus for manufacturing concrete sections and having a movable bin for progressively discharging a layer of concrete, a shaft rotatably supported behind said bin for movement therewith, means for rotating said shaft, said shaft projecting rearwardly in the line of movement of the bin, a first eccentric disc on said shaft, a ring within which said disc is rotatable, a first tamping member positioned to engage the concrete layer, push rods projecting upwardly from said tamping member, a cross member connecting said push rods above said rotatable shaft, an elongated actuating member between said ring and cross member for causing up and down movement of the cross member when said shaft is rotated, means for varying the length of said actuating member, a second eccentric disc on said shaft behind the first disc, a ring within which said second disc is rotatable, a second tamping member positioned to engage the concrete layer behind the first tamping member, an elongated actuating member connecting said second tamping member and the ring which surrounds said second eccentric disc, and means for varying the length of said last-mentioned elongated actuating member.

3. In an apparatus for manufacturing multi-layer concrete sections with the use of pre-tensioned wires, said

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apparatus having a bin movable in the direction of extent of said wires for progressively discharging a layer of concrete over said wires, tamping apparatus connected to said bin and located behind the latter and positioned to tamp said layer after it has been laid and before another layer is laid thereover, said tamping apparatus including a tamping member having spaced grooves in its bottom spaced apart the same distance as the spacing between wires with each groove located to form a ridge around a wire which extends in the same direction as the latter, said tamping member having spaced surfaces between grooves located to compact the concrete between wires, means for causing movement of said tamping member a sufficient distance downwardly to form grooves in the concrete layer between wires, and a second bin spaced rearwardly of said tamping apparatus for discharging a second layer over said tamped and grooved first layer to interlock with the grooves therein.

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