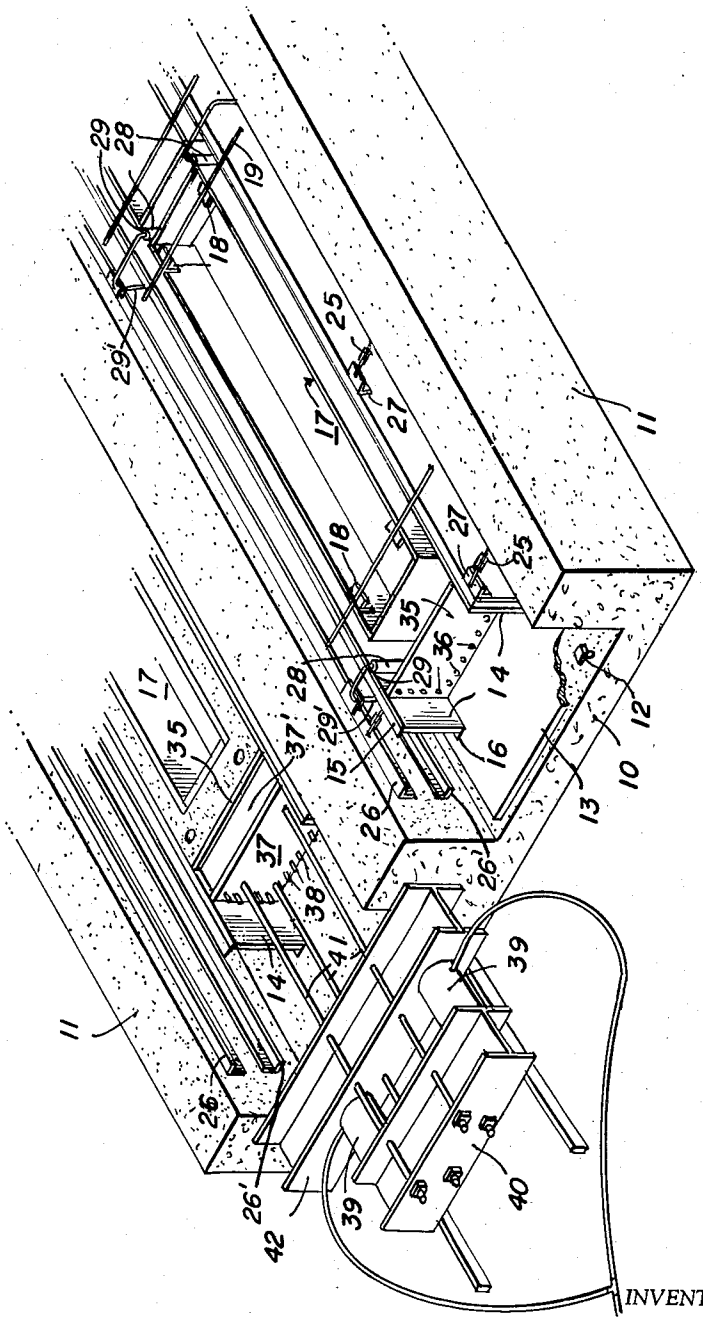
Jan. 3, 1961 W. C. FULLER ET AL 2,966,717

APPARATUS FOR CASTING CONCRETE ELEMENTS

Filed Sept. 21, 1956

FIG. 1



INVENTORS

WILFORD C. FULLER

C. PERCY OLIVER

BY R. Clyde Jouett

ATTORNEY

United States Patent Office 2,966,717 Patented Jan. 3, 1961

2,966,717

APPARATUS FOR CASTING CONCRETE ELEMENTS

Wilford C. Fuller, Silver Spring, Md., and Crawford Percy Oliver, Arlington, Va., assignors, by mesne assignments, to Northern Virginia Construction Company, Incorporated, Alexandria, Va., a corporation of Virginia

Filed Sept. 21, 1956, Ser. No. 611,119

2 Claims. (Cl. 25—121)

This invention relates to a device for casting lightweight prestressed concrete beams to be used in making a decking for a bridge or a floor for a building.

An object of this invention is to provide a device for producing a series of accurate precast prestressed concrete beam-like units which will accurately fit together side by side to form a solid deck for a bridge structure (or the floor of a building). This is accomplished by providing direct contact areas between the units at spaced diaphragms and at end blocks as shown in my copending application Serial No. 611,121, now Patent No. 2,885,882, in which the beam-like elements are shown as being channel shaped.

A further object of the inventon is to provide a mould in which such a beam, or similar element, may be cast and in which the accuracy of the dimensions of such element may be held to very close tolerances.

A yet further object of the invention is to provide a casting bed for the casting of accurately dimensioned concrete elements.

Other and further objects and advantages of the present invention will appear from the following description taken with the accompanying drawing in which like reference characters designate like parts in the several views and in which:

Fig. 1 is a fragmentary perspective view of the casting bed showing a mould in place ready for the insertion of the reinforcements and showing a mould with the reinforcements stressed and the concrete poured.

As seen in Fig. 1, the casting bed **10** may be made of concrete and comprises a base and at least two abutments or curbs **11**. If a large number of elements are to be made it would, of course, be economical to provide more curbs so that several elements could be made simultaneously.

The material of the base and curbs is preferably of concrete but is not critical other than to provide adequate strength and rigidity.

Leveling bolts **12** are screwed into inserts in the base and are adjusted with a precision leveling instrument to a true elevation. This can, of course, be done to a very high degree of accuracy.

Slate slabs **13**, which are obtained under a tolerance specification of plus or minus $\frac{1}{32}$ inch both as to planeness of surface and thickness are placed on the leveling bolts **12** so that each leveling bolt bears on the slate. It will be seen, then, that the bed on which the concrete element is to be cast is prepared to an accuracy of plus or minus $\frac{1}{32}$ inch or better. The back of the channel-shaped beam-like element is cast against this bed surface to give the degree of accuracy required to assure accurate face to face contact between elements when assembled.

The next important consideration is the faces of the beam-like elements that will be in contact with the back of the adjacent beam. These surfaces too must be held within a small tolerance. To accomplish this, the side

forms are made with faces **14** of plywood or other suitable material and angle iron tops **15** and bottoms **16**. These elements are bolted together so that the top and bottom angles are straight lines, parallel to each other and are, at all points, the same distance apart. These side forms may be made in short sections for retention of shape and for ease of handling.

The beam-like element, is of channel shape but is formed with end blocks filling the space between the flanges and web at the ends of the element and with one or more diaphragm blocks similar to the end blocks spaced along the length of the channel. These diaphragm blocks and end blocks are formed by provision of a core **17** between the side forms so that the hollow portions of the channel between the flanges and the diaphragm blocks and end blocks are left in casting the element. These cores may conveniently be rectangular boxes of plywood or other flat rigid material with angle iron or other bracing in the inside corners.

In the inner surfaces of cores **17** are angle iron clips **18** flush with the top edge of the core.

Cores **17** are supported by hangers **19** of angle iron resting on the side forms. These hangers are secured to the cores and side forms by means of a quick-release clamping device (not shown).

The side forms **14** are held in proper position by means of adjustable hooks **25**. One end of the hook engages a hole through a continuous angle iron **26** fastened to concrete curb **11** while the other end engages a hole in the clip angle **27** which is secured to the side form **14**. Once these hooks are adjusted for the correct side form position, the side forms are either removed from or replaced on the slat by disengaging the hooks from the clip angle **27** or by the reverse process. For the sake of rigidity these hooks may be placed at angles to the curb and to the mold and should not be parallel.

At each diaphragm and end block two sleeve elements must be cast into the concrete to form holes completely through the beam. When the beams (or units) are placed in the final position to form the finished deck, these holes must be in alignment so that the lateral post-tensioning cables described, in the copending application, can be threaded from one side of the deck to the other.

As the beam is cast on its side these sleeves **28** are in vertical position at the time of casting. They must be held in a true vertical position. This is accomplished by means of a sleeve holding device which is easily removable. The leg of the sleeve holder **29** is slipped through the sleeve **28**. This combination is then placed in casting position by dropping the other sleeve-holder leg **29'** which must be parallel with leg **29**, through a hole in bracket **32** mounted on upper angle iron **26**. A similar bracket is fastened to the bottom curb angle **26'** and the lower end of the sleeve-holder leg **29'** goes through a hole in the bottom bracket. These two holes are set in a true vertical position which will in turn maintain the leg **29** in its true vertical position. It can be seen that after the concrete is cast around the sleeve, the sleeve holder can be picked up, leaving the sleeve **28** in the concrete.

Beam ends are formed by inserting bulkheads **35** between the side forms. These bulkheads **35** are provided with holes **36** to accommodate the passage of prestressing reinforcing wires to reach to and through stressing plates **37**.

The prestressing steel is stressed by means of equipment as shown in the left-hand casting bed. One type of prestressing steel that may be used is a high tensile strength seven-wire strand. Use of such strand is described herein. Individual strands are placed through holes **36** in bulkheads **35**, through corresponding holes

in stressing plates 37 and suitably anchored at 38. The number of strands and the pattern in which they are arranged is in accordance with individual design. The stressing plate 37 is duplicated at the opposite end of the casting beds. Each individual strand is then stressed to a predetermined tension by any convenient means. The hydraulic rams 39 are activated, thereby forcing jacking head 40 outwardly. The stressing plate 37 follows this outward movement due to the connecting bolts 41 thereby stressing all the strands simultaneously and equally. The resulting pressure at the hydraulic ram bases is transferred to the concrete casting bed curbs 11 through the bucking head 42. After desired tension is achieved by this method the hydraulic rams may be replaced by steel struts so that the hydraulic rams may be used elsewhere. In order that the stressing plate 37 may have absolute rigidity, a plurality of strengthening webs 37' are secured ot the back side of the stressing plate and holes are provided around the margin at the edges in order to provide the passages for the prestressing steel which pass through these holes and are anchored by means 38. Means 38 may be any conventional anchoring means.

Lifting bolts may be placed in two of the diaphragms during casting to facilitate lifting the cured beam from the casting bed.

In using this device it is of course necessary first to set up the casting bed slates 13 and to erect on these casting slates the side forms 14 which are placed into position by hooks 25 and on which the core boxes 17 are supported and secured by angle bars 19, accurately located by pins and secured in place by clips. Sleeves 28 are secured in place. Prestressing steel is threaded through apertures 36 in bulkheads 35 and through holes in stressing plates 37. Each strand is stressed to a predetermined tension in any conventional manner, and anchored by any convenient anchoring means 38. Hydraulic rams 39 are then actuated to simultaneously stress all of the prestressing steel strands to the desired degree and the concrete is poured in the mold around the prestressed strands and around the sleeves 28 and is brought up level with the top edges of mold sides 14, core box 17, and bulkhead 35. The ends of core boxes 17 and bulkheads 35 may be slightly higher than the sides of the core box and the side forms 14 in order that the surfaces at the end blocks and at the diaphragms may extend slightly beyond the edges of the flanges in the finished beam element for reasons explained in the copending application referred to above.

The above description is of a preferred form and other

exemplifications of the invention and of the several features of the invention may be used in other combinations, and changes and modifications in design, structure and details may be made within the scope of the appended claims without departing from the spirit of this invention.

What is claimed is:

1. In a molding device for molding concrete elements, such as beams or the like, of the type in which vertical mold elements having accurately formed top and bottom edges are removably supported on a bed; a bed substantially longer than the elements to be cast, said bed being formed with a bottom portion and two parallel upstanding curbs aligned with said bottom portion extending the length of the bed, whereby stressing means abutting the ends of said curbs may be used to prestress longitudinal reinforcements to be cast into a beam, leveling bolts mounted for vertical adjustment with respect to said bottom portion, and an accurate surface comprising at least one sheet of slate supported by said leveling bolts.

2. In a molding device for molding concrete elements, such as beams or the like, of the type in which vertical mold elements having accurately formed top and bottom edges are removably supported on a bed; a bed substantially longer than the elements to be cast, said bed being formed with a bottom portion, leveling bolts mounted for vertical adjustment with respect to said bottom portion, and an accurate bed surface comprising at least one sheet of slate supported by said leveling bolts.

References Cited in the file of this patent

UNITED STATES PATENTS

761,255	Rowell et al.	May 31, 1904
832,594	Collier	Oct. 9, 1906
883,439	Wittbold	Mar. 31, 1908
1,050,946	Jensen	Jan. 21, 1913
1,457,991	Moore	June 5, 1923
2,153,741	Cobi	Apr. 11, 1939
2,306,107	Henderson	Dec. 22, 1942
2,315,634	McCall	Apr. 6, 1943
2,495,100	Henderson	Jan. 17, 1950
2,510,810	Furst	June 6, 1950

FOREIGN PATENTS

151,075	Australia	Apr. 24, 1953
379,316	France	Sept. 5, 1907
649,035	Great Britain	June 17, 1951
712,892	Great Britain	Aug. 4, 1954
711,203	Great Britain	June 30, 1954
749,124	Great Britain	May 16, 1956