June 1, 1965 C. I. WILLIAMS 3,186,679

CONCRETE FORM ASSEMBLY AND CLAMPING MEANS THEREFOR

Filed April 13, 1961 2 Sheets-Sheet 1

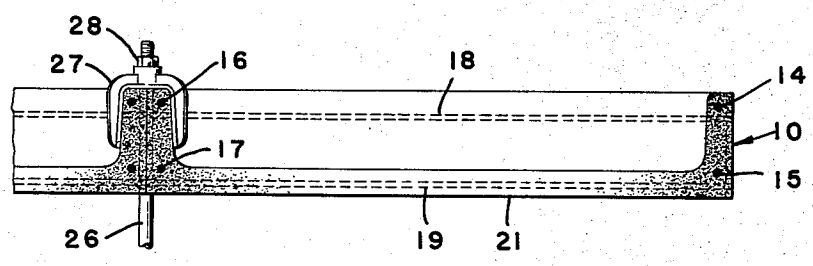

FIG. 1

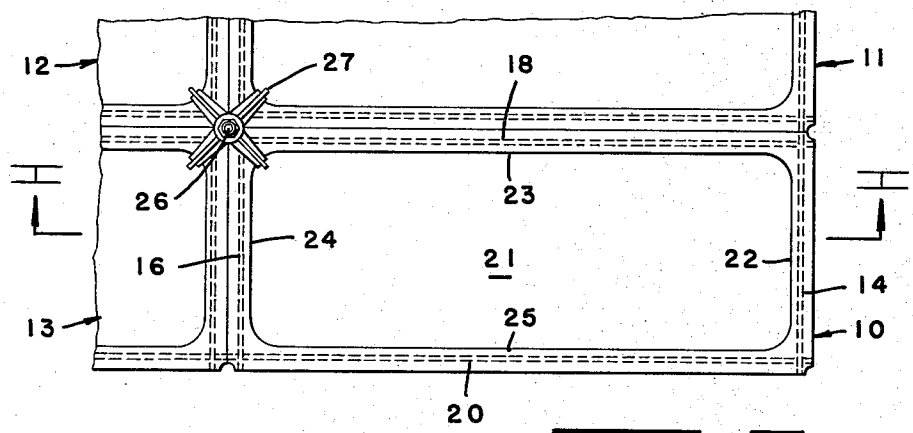

FIG. 2

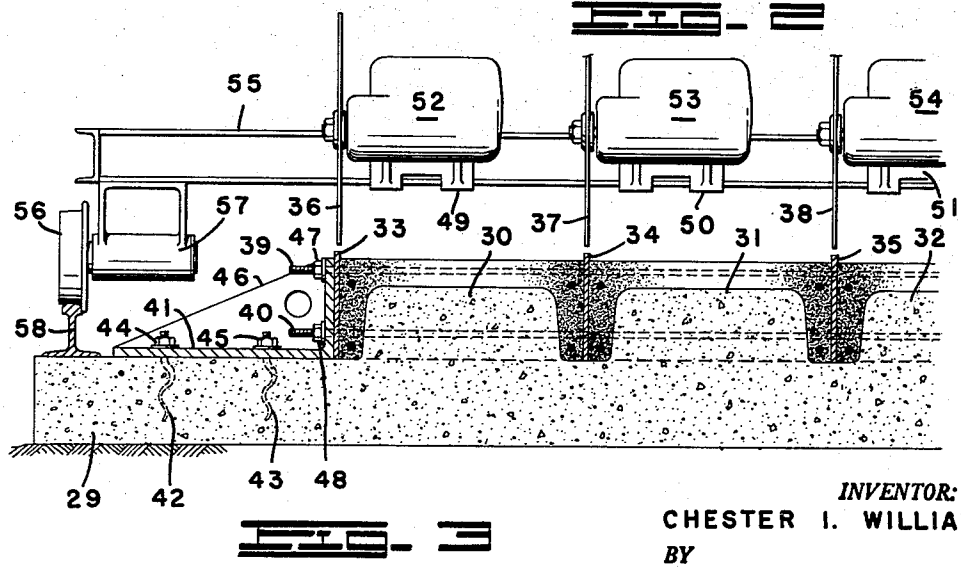

FIG. 3

INVENTOR:
CHESTER I. WILLIAMS
BY
Glenn B. Evans
atty.

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CONCRETE FORM ASSEMBLY AND CLAMPING MEANS THEREFOR

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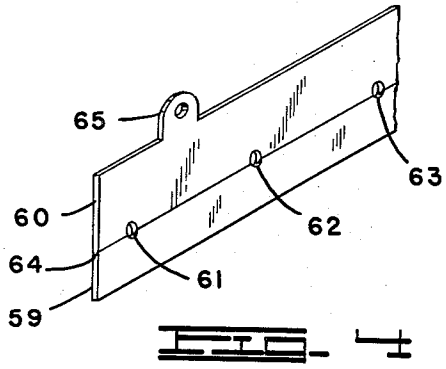

FIG. 4

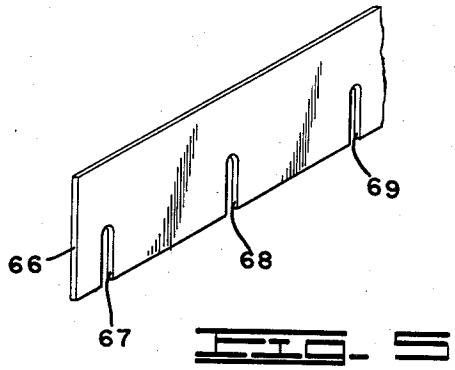

FIG. 5

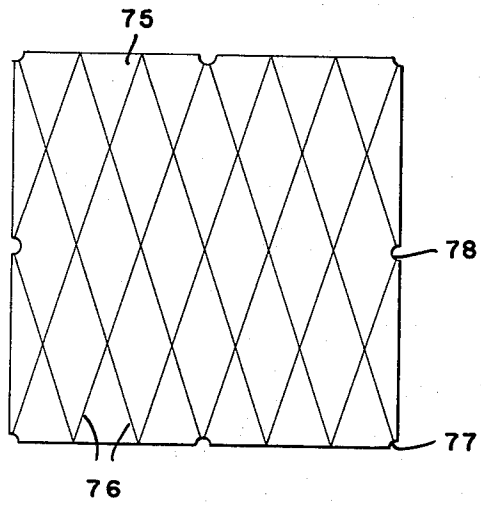

FIG. 7

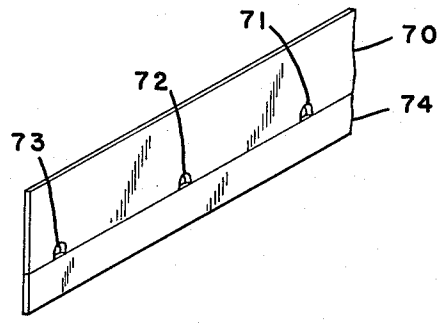

FIG. 6

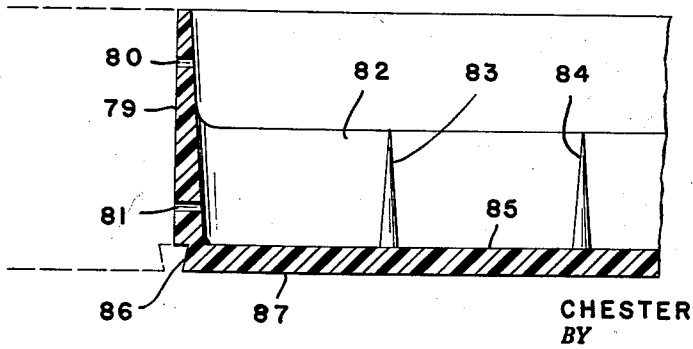

FIG. 8

INVENTOR:
CHESTER I. WILLIAMS
BY
Glenn B. Gross
atty.

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3,186,679

CONCRETE FORM ASSEMBLY AND CLAMPING MEANS THEREFOR

Chester I. Williams, 347 Greenbriar SE., Grand Rapids, Mich.

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1 Claim. (Cl. 249—192)

This invention relates to the construction of forms used to position concrete as it is poured. Usual form construction involves panels of planking, plywood, or steel reinforced by parallel stiffeners. Sections of this type of form construction are normally built on the job, if wooden construction is used, to suit the particular requirements as to size, spacing of securing points, and other such variables. Steel units are normally prefabricated. Large numbers of the form sections are used on each job, and represent a sizeable investment to the contractor.

The present invention provides for the factory manufacture of form elements to order without substantial metal-working, and yet with a sufficient precision to assure reduced tolerances. The form elements produced by this invention are indefinitely re-usable until damaged, and invite further efficiency by applying an incentive to engineers to design structures for the use of standard form elements. Forms embodying this invention are themselves constructed of cast material; and when concrete is used, suitable reinforcement is incorporated. These form elements are preferably of a predetermined cross-section to give an adequate strength-weight relationship.

The invention provides a master form used for the production of the form elements, and arrangements are incorporated for prestressing the reinforcing rods. Equipment is also provided for separating the newly-cast elements from a large group that are cast at the same time. The several features of the invention will be analyzed in detail through a discussion of the particular embodiments illustrated in the accompanying drawings. In the drawings:

FIGURE 1 presents a sectional plan view showing the cross-section of two form elements at a point of junction, and illustrating a possible arrangement for securing these elements in position to impound plastic concrete.

FIGURE 2 presents an elevation of the structure shown in FIGURE 1.

FIGURE 3 illustrates the master form for constructing the form elements, and shows auxiliary equipment for separating the form elements from the group that is cast at one time, the separation involving the cutting of reinforcing rods in spaces between the form elements.

FIGURES 4, 5, and 6 ilustrate various possibilities of construction of the plates used to separate the form elements from each other in the master form.

FIGURE 7 is a plan view of a cast form element incorporating one of an infinite number of possible surface designs for imparting such a design to the concrete as it is poured.

FIGURE 8 illustrates a modified form of the invention involving a form element constructed of plastic material other than concrete.

Referring to FIGURES 1 and 2, the form elements indicated generally at **10**, **11**, **12**, and **13** are of poured concrete, and are of identical construction. Each of these involves a pair of reinforcing rods as shown at **14–15** and **16–17** extending along the narrower ends, and pairs of similar rods as shown at **18–19** (and at **20**) extending along the longer edges. These reinforcing rods are all preferably pre-stressed in order to permit the form elements to withstand the forces involved without cracking. Each of the form elements is preferably formed with a central panel portion **21** surrounded by side flanges **22–25** for the necessary strength-weight relationship. The positioning of the reinforcing rods within the side flanges provides for sufficient spacing between the rods to create adequate strength.

At each corner of each of the panels **10–12**, a ninety degree sector of a cylindrical surface is incorporated so that four adjoining panels may together define a cylindrical opening for receiving a bolt as shown at **26**. This may be of a variety commonly known as a "shebolt" used to secure form elements to anchors embedded in the concrete of the structure being controlled by the form elements. The use of a "spider" **27** at the junction of the form elements serves the dual purpose of providing a securing point for the bolt **26** at the nut **28**, and also functions to hold the form elements tightly together. The sides of the flanges **22–25** will normally be provided with a slight taper (commonly referred to as "draw") to facilitate removal from the master form, and this taper may be incorporated in the legs of the spider and utilized to apply a closing action to urge the form elements tightly together as the nut **28** is tightened. The forces applied to the form elements by the spiders **27** and the nuts **28**, prior to the pouring of the concrete C controlled by the form system, are normally resisted by suitable spacers or stop means (not shown) associated with the shebolts **26**. These are conventional, and may be in the form of cross pins, removable rings, etc. The form elements are positioned by the combined effect of the nut-spider assemblies acting through the form elements against the stop means.

The construction of the master form used to produce the form elements **10–13** is illustrated in FIGURE 3. A heavy base slab **29** is preferably poured upon a carefully-prepared grade surface on the ground, and may incorporate the usual reinforcing rods (not shown) to prevent cracking. The top surface of the slab is either cast with a group of projections as shown at **30**, **31**, and **32**, or these may be added later after a flat base portion of the slab **29** is cast in place. The spacing between the projections **30–32** provides for the side flanges of the form elements shown in FIGURES 1 and 2. Separating plates **33–35** are laid in place either prior to or as the concrete is cast to form the form elements, these plates establishing a plane of separation between the elements for the entry of the cutting saws **36**, **37**, and **38** which sever the previously-continuous reinforcing rods extending throughout the master mold in the spaces between the projections **30–32**. In this fashion, a large waffle-type pattern on the master mold will produce a correspondingly large group of form elements at each casting. Prior to casting the form elements, the master mold is coated with suitable materials known in the art to prevent adhesion. After the concrete of the form elements has hardened, the reinforcing rods (as indicated at **39** and **40** in FIGURE 3), which originally extended from one side of the master form to the other, are severed at the parting planes between the form elements so that the elements may be handled as separate items.

To provide for the pre-stressing of the rods (such as the rods **39** and **40**) it is preferable that a frame rail in the form of the angular member **41** be used to define the outer boundary of the area receiving the poured concrete for the form elements. These may be secured in place through a group of conventional embedded anchors as shown at **42** and **43**, and nuts as shown at **44** and **45**. Periodically along the length of the rail **41**, it is preferable to incorporate a triangular web as shown at **46** to stiffen the structure against the loading resulting from tensioning the rods **39** and **40**. The web **46** is preferably positioned closely adjacent to the terminals of the rods **39** and **40**. The tensioning can be controlled through the careful application of a predetermined torque to the nuts **47** and **48**.

When the proper degree of tension has been applied to

the rods, and the concrete which will form the form elements 10–13 has solidified and cured, the separating plates 33–35 are removed to expose a space between the several form elements. The cutting saws 36–38 are then admitted into this space, and the cutting operation begun by lowering the saws into active position through adjustment of the conventional brackets 49–51. The motors 52–54 are carried on a frame 55 spanning the master form and supported on wheels as shown at 56 mounted on shafts journaled in suitable bearings as shown at 57. A conventional railroad rail 58 extends along the sides of the master mold, and is secured in position with sufficient accuracy to serve as a reference point for the action of the saws. A simple form of guiding system (not shown) of conventional design may also be incorporated in each of the saws. A detector on such a mechanism would follow the space defined by the separating plates 33–35, and provide automatic alignment for positioning the saws with respect to the detector position. Such an arrangement is commonly known as a "follower" mechanism. The functioning of the saws is to sever the rods 39 and 40 to permit independent handling of the form elements. In some applications, it will be desirable to slot the rails 41 to permit a through-passage of the cutting saws.

Several possibilities are contemplated for the separating plates 33–35, and three of these are shown in FIGURES 4, 5, and 6. The primary design objective as far as these details are concerned, is to expose enough of the rods on withdrawal of at least a portion of the separating plates to permit the saws 36–38 to perform their function without encountering the plates themselves. In FIGURE 4, the lower component 59 and the upper component 60 together define the openings 61, 62, and 63 for receiving the reinforcing rods. The lower component is provided with a V-shaped groove as shown at 64, the depth of this groove being sufficient to extend to the bottom of the openings 61–63. Removal of the upper components 60 through forces applied at the lifting lug 65 will therefore expose the full depth of the reinforcing rods at the center of the groove 64. It is preferable that the lower edge of the upper component 60 have a V-shaped projection to register with the groove 64.

In the modification shown in FIGURE 5, the plate 66 has a group of slots 67–69 for engagement with the reinforcing rods, the withdrawal of the plate 66 leaving the concrete underneath the rods intact so as to require a breaking action to separate the form elements after the rods have been severed. The projecting material at the break may be ground off, if desired, to provide a continuous surface.

In the modification shown in FIGURE 6, the upper plate section 70 has a group of notches 71–73 which combine a semi-cylindrical section with a straight side to permit direct withdrawal of the upper section 70. The lower section 74 has a continuous upper edge.

The method of construction of the form elements lends itself to the production of form surfaces which can be used to create design patterns in the concrete controlled by the forms. Such an arrangement is shown in the form element 75 illustrated in FIGURE 7. A pattern of lines as shown at 76 of any desired arrangement can impart the design features, or various portions of the form surface may be displaced with respect to each other to form a bas-relief. As with the form elements previously discussed, a group of notches are provided in the edges of the form elements as shown at 77 and 78 for receiving bolts of the type indicated at 26 in FIGURE 1. With the semi-cylindrical notches 78 at the half-point on the form, it becomes more practical to use the form in the so-called "cantilever" arrangement without the use of auxiliary bracing.

In the modification shown in FIGURE 7, a form element of plastic material other than concrete is illustrated. The side flanges 79 are provided with openings as shown at 80 and 81 for receiving fastenings to tie the adjacent form elements together, and reinforcing ribs as shown at 82, 83, and 84 are preferably incorporated to stiffen the panel section 85. A notch as shown at 86 in the edge of the form element is preferably used to define a recess for receiving a sealing strip which may be driven in place to assure a continuous surface 87 for receiving the poured concrete of the construction project.

The particular embodiments of the present invention which have been illustrated and discussed herein are for illustrative purposes only and are not to be considered as a limitation upon the scope of the appended claim. In this claim, it is my intent to claim the entire invention disclosed herein, except as I am limited by the prior art.

I claim:

A system of forms for positioning concrete as it is poured, comprising: a plurality of form elements of cast material each including a substantially polygonal panel portion and peripheral flange portions, said flange portions having the exterior surfaces thereof disposed in planes normal to the said panel portion, and having interior surfaces inclined to said exterior surfaces to produce a taper of said flange portions to reduced thickness, proceeding from said panel portion, and extending substantially throughout the height of said flange portions, said flange portions having corners containing discontinuities, each defining a fraction of an opening transverse to said panel whereby said discontinuities of each corner together with those of a plurality of similar corners define a complete opening when at least three of said elements are assembled together; fastenings traversing said openings, and being similar thereto in cross section; and securing means for said form elements including members adapted to embrace the interior inclined surfaces of adjacent flanges of at least three of said elements at the intersection thereof, said members also being adapted to receive said fastenings whereby said form elements are held in place and urged together as said fastenings are advanced towards said panels.

References Cited by the Examiner

UNITED STATES PATENTS

1,032,419	7/12	Morrill	25—131
1,250,032	12/17	Schub.	
1,567,210	12/25	Trester	25—131
2,193,847	3/40	Strong.	
2,394,227	2/46	Barber	25—154
2,447,670	8/48	Rumble	25—131
2,449,912	9/48	Rumble	25—131
2,479,106	8/49	Carnier	25—131
2,506,485	5/50	Boudousquie	25—131
2,514,805	7/50	Seymour	25—121
2,624,929	1/53	Reed	25—121
2,671,941	3/54	Fabian	25—121
2,816,345	12/57	Symons	25—131
2,950,517	8/60	Brickman	25—154

FOREIGN PATENTS

567,221	12/58	Canada.

MICHAEL V. BRINDISI, *Primary Examiner.*

WILLIAM J. STEPHENSON, ROBERT F. WHITE, NEDWIN BERGER, *Examiners.*