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[54] **APPARATUS FOR ALIGNING FORMS**
1 Claim, 4 Drawing Figs.

[52] **U.S. Cl.** ..... **249/192,** 25/131 CP, 18/43, 249/165
[51] **Int. Cl.** **E04g 9/00**
[50] **Field of Search** ..... 249/192, 196, 163, 165, 160; 25/131 CM, 131 CP; 18/43

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ABSTRACT: Concrete form sections are made ready for easy subsequent alignment by cutting aligned holes in the opposed end bulkheads of the sections to be aligned and placing between the sections and within the holes alignment devices each of which consist of a set of two apertured plugs which are received upon and snugly engaged with a tapered pin. Each plug of a set is welded to one of the opposing bulkheads and the pin is then removed to permit the form sections to be separated. When the sections are subsequently aligned at the concrete pouring site, each pin is hammered back into snug engagement with its associated pair of plugs.

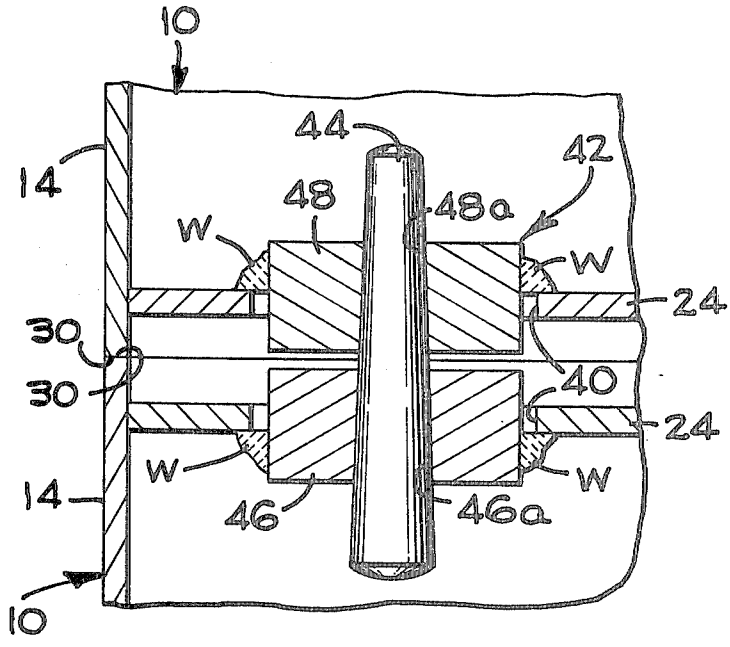


FIG_1

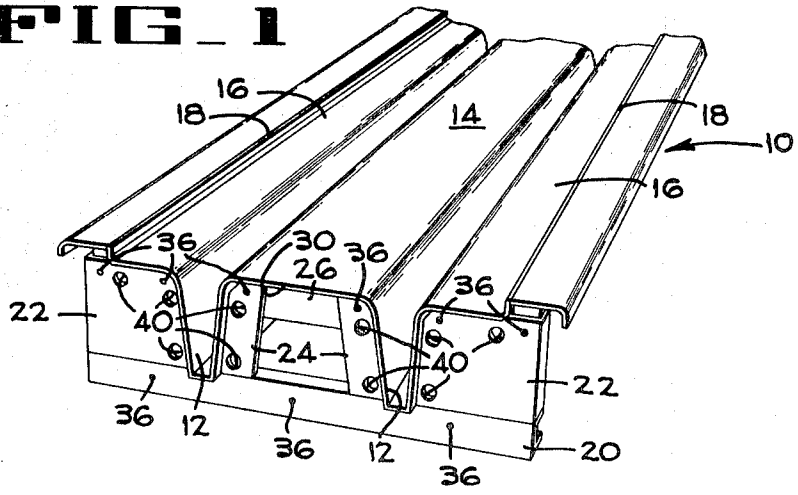
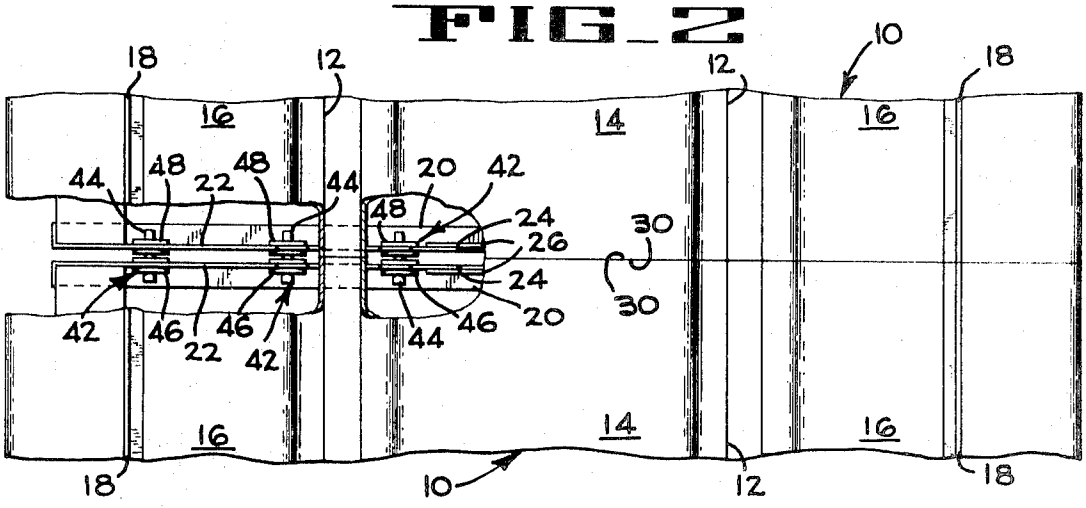


FIG_2



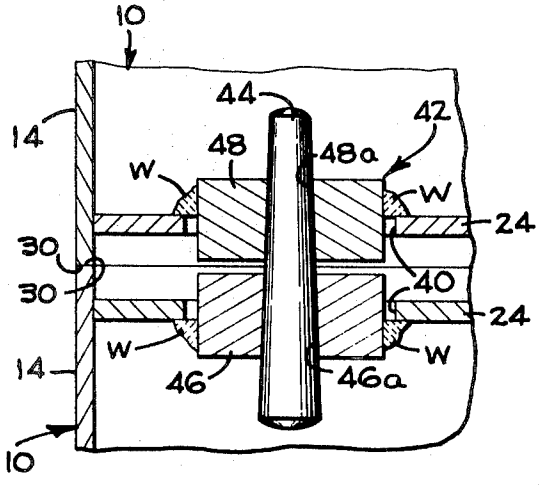
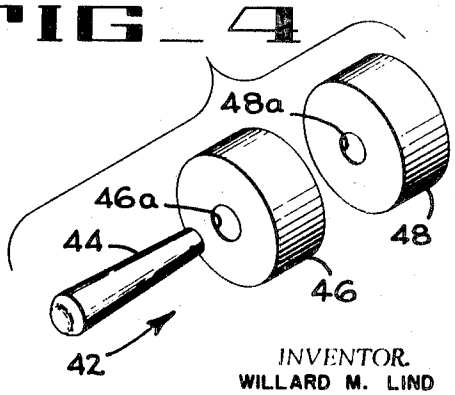


FIG_3

FIG_4



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APPARATUS FOR ALIGNING FORMS

BACKGROUND OF THE INVENTION

1. Field of the Invention

In general, this invention pertains to that field of art concerned with metallic forms for concrete structures, and more particularly, it pertains to a means for and a method of precisely aligning adjacent metallic form sections in the field at the concrete pouring site.

2. Description of the Prior Art

In the manufacture of forms for the precast and prestressed concrete industry, the forms are usually fabricated in lengths no greater than from 10 to 40 foot sections in order to eliminate the difficult handling problems and excessive material costs involved in making longer forms. Both at the job site and in the casting plant, therefore, the forms are frequently required to be used in multiples to create a single form, which may be several hundred feet in length, to cast products in multiples or singly in various intermediate lengths. Since the concrete product to be cast in the forms must be uniform in shape throughout its length, each individual form section in the multiple form must be accurately aligned with the adjacent form sections so that no unsightly casting seams or broken surfaces will be formed when the concrete is poured. The manufacturer of the forms must therefore take great care in their production so that the adjacent form sections will be able to be aligned precisely in the field. After the assembly and welding of the supporting frame and reinforcement for each of the form sections, the ends thereof will be carefully ground by the manufacturer to form a flat plane exactly transverse to the longitudinal axis of the form. The adjacent sections of the overall form can then be aligned on a conventional perfectly flat aligning table with the ground ends being brought into abutting engagement. Finally, the aligned ends are match-marked so that they will be readily identifiable for reassembly in the field.

When the forms are assembled and aligned again at the concrete pouring site, the match-marked ends are brought together and bolts are run through predrilled holes in the reinforcement or bulkheads at the ends of the form sections in order to tightly secure the sections together. Problems, however, have been encountered in aligning the form sections in the field chiefly because the surfaces on which the sections are placed are not always perfectly flat. Under such conditions a considerable amount of time is spent in shifting form sections relatively to each other in order to get them aligned. This frustrating shifting and pivoting of the form sections prior to the tightening of the connecting bolts results in costly and time consuming construction delays, and a need for a simple and effective means of aligning the form sections has existed in the concrete forming industry for a considerable period of time.

SUMMARY OF THE INVENTION

The present invention provides a method and a means whereby the adjacent end edge surfaces of metallic form sections can be precisely aligned in the field. Basically, the invention comprises an alignment device consisting of a pair of apertured plugs secured together in spaced relationship by a tapered pin which is received within the apertures in the plugs in a snug engagement therewith. This alignment device is utilized during the initial alignment of the form sections at the manufacturer's plant where the perfectly level aligning tables are available. When the adjacent form sections are aligned on these tables, the alignment device is placed within a pair of precut holes in the opposing bulkheads at the ends of the sections. Each of the plugs is welded to one of the opposed bulkheads. The pin is then removed from its position within the plugs allowing the form sections to be separated, and the ends are then match-marked for identification. When the form sections are again assembled at the job site or in the casting plant, the tapered pin is driven back through the plugs to bring the edges of the forms into the same precise alignment originally achieved at the manufacturer's plant. The form sections can then be fastened together in this exact alignment with the conventional bolting means.

The method of the present invention has resulted in considerable savings of both time and money for the precast and prestressed concrete industry due to the elimination of much of the time consuming labor involved in the previous trial-and-error aligning of adjacent form sections. This is of particular importance and significance today because of the greatly increased production of precast and prestressed products whereby many different forms are used in the same casting bed with the individual form sections being assembled and disassembled many times during their useful life. In the expected increase use of precast concrete products in the future, the present invention will no doubt find even greater favor.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of one end of a double T-beam concrete form section adapted to utilize the alignment method and apparatus of the present invention.

FIG. 2 is a plan of a pair of aligned and engaged double T-beam concrete form sections of the design shown in FIG. 1, with a portion of the form sections being broken away in order to illustrate the alignment means of the present invention.

FIG. 3 is an enlarged section through one of the alignment devices shown in FIG. 2.

FIG. 4 is an exploded view of the alignment device shown in FIG. 3.

DESCRIPTION OF THE PREFERRED EMBODIMENT

In describing the form aligning method of the present invention, the alignment of two form sections **10** of the conventional double T-beam design will be depicted although it will be obvious that the particular design of the form is immaterial in carrying out the principles of the invention. The double T-beam form section, as shown in FIG. 1, generally comprises a steel form member including a pair of tapered rib-forming pockets **12** which are separated by a flat slab-forming surface **14**. Extending outwardly from the rib-forming pockets are horizontal slab-forming surfaces **16** and upturned side edge-forming flanges **18**. The forms are supported upon a spaced series of transversely extending channel members **20**, only the end one of which is shown in FIG. 1. Bulkhead members are provided upon the channel members in order to reinforce and rigidify the form structure, such bulkhead members including outer plates **22** supporting the slab-forming surfaces **16** and a pair of upstanding plates **24** and connecting cross bracket **26** for supporting the central slab-forming section **14** of the form. It will be noted that the transversely extending edge **30** at the end of the form section is located slightly outwardly from the face of the adjacent bulkhead plates **22** and **24**; consequently, only this edge needs to be aligned with the matching edge on the adjacent form section in order to provide a continuous molding surface across the adjacent form sections.

When the manufacture of a form section, such as shown in FIG. 1, is complete, the end edges **30** of the form will be ground upon a precision grinding machine so that they will be perfectly flat and everywhere at right angles to the longitudinal plane of the form section. A pair of adjacent form sections may then be brought together with the end edges **30** placed in abutting engagement, and any imperfections or misalignment in the forms will be corrected at that time. These operations are carried out upon specially constructed aligning tables which are perfectly flat so that the alignment obtained will be correct. When the form sections are to be realigned, the end edges **30** are again placed in abutting engagement and bolts are placed through specially provided boltholes **36** in the channel members **20** and in the bulkhead plates **22** and **24** and secured in place. The boltholes are slightly oversized to allow the form sections to be shifted slightly relative to each other in order to attain the proper alignment of the end edges.

Since the footings or foundations in the field where the form sections are again reassembled are not always as level as was the alignment table in which the forms were originally aligned, a great deal of time is usually expended in aligning the forms before the bolts can be tightly secured within the boltholes **36**. The method of the present invention was designed to eliminate this unnecessary maneuvering of the adjacent form sections in the field and is adapted to be used by the manufacturer of the forms to prepare them for easy subsequent realignment by the users.

Initially, holes **40** of approximately **2** inches in diameter are punched into the bulkhead plates **22** and **24** at conveniently spaced locations about the edges thereof supporting the form, such as is shown in FIG. **1** for example. When two form sections are placed in aligned and abutting relationship as described hereinbefore, the holes on the opposed bulkheads will be generally aligned within normal manufacturing tolerances. An alignment device **42**, shown in an exploded view in FIG. **4**, is then utilized to connect the two adjacent form sections by being placed through the aligned holes in the forms in the manner shown in the sectional view of FIG. **3**. This alignment device includes a tapered dowel pin **44** and two plugs **46** and **48** having axially positioned apertures **46***a* and **48***a* extending therethrough, respectively. Each of these apertures are tapered within the plug to the same degree as the taper on the dowel pin **44** so that the dowel pin may be passed through the plugs and received in snug engagement therein as shown in FIG. **3**. It will be noted that the spacing between the plugs when they are received upon the dowel pin is approximately the same as the spacing between the opposed bulkhead plates at the ends of the adjacent abutting form sections. Consequently, when the assembled alignment device **42** is placed between the abutting form sections, the plugs will generally centrally located within the holes **40** in the bulkheads. In this spacial position, each plug is welded at W about the periphery of the hole to its associated bulkhead plate to permanently fix it in position. Once the plugs are completely secured by welding, the connecting dowel pin can be removed and the forms can then be separated. As is conventional, the adjacent forms are then match-marked for ready identification.

When the form sections are to be reassembled, the match-marked sections are brought into reengagement with the end edge surfaces **30** in abutment. The dowel pins **44** are then reinserted through the roughly aligned apertures **46***a* and **48***a* in the plugs **46** and **48** by driving them through the plugs until they are received in snug engagement therewithin. The end edges **30** of the forms should now be in precise engagement as shown in the plan view of FIG. **2** and as was attained during the initial alignment of the forms at the manufacturing plant since the dowel pins **44** will be in precisely the same spacial location with respect to the forms as they were initially. The bolts are now secured through the slightly oversized holes **36** in the bulkheads to positively secure the sections together and the completed form will then be ready for the pouring of the concrete mix.

It can be seen that the alignment device of the present invention and the aforedescribed method provide a simple and yet highly effective means of aligning forms under field conditions, i.e., under conditions such as uneven or irregular supporting ground surfaces which might not be ideal for the abutment of a pair of thin end edges. The initial alignment operation is carried out under manufacturing shop standards wherein perfect alignment can be obtained quite easily while the subsequent alignment operation which in the past proved to be difficult now requires only the driving of a pin through two roughly aligned apertures. The aligning device, including the two plugs and connecting tapered pin, is seen to be quite simple in construction and consequently can be manufactured without unduly increasing the cost of the forms to the user.

Although the best mode contemplated for carrying out the present invention has been herein shown and described, it will be apparent that modification and variation may be made without departing from what is regarded to be the subject matter of the invention as set forth in the appended claims.

Having completed a detailed description of the invention so that those skilled in the art could practice the same, I claim:

1. In a composite metallic form which comprises a pair of form sections joined together along transversely extending and abutting edge surfaces, each of said form sections having a bulkhead extending transversely thereof and spaced slightly inwardly from said end edge surface, and a pair of aligned holes being provided in the opposed bulkheads; an alignment device comprising a first plug member adapted to be rigidly secured within one of said holes, a second plug member adapted to be rigidly secured within the other of said holes, and a connecting member arranged to be securely attached to each of said plug members for maintaining each of said plug members in a predetermined spatial relationship with respect to the other plug member, one of said members having a frustoconical exterior surface portion of and another of said members having a frustoconical interior surface portion exactly matching the frustoconical surface portion of said one member whereby said predetermined spatial relationship of said plug members is determined by the relationship of said one member and said other member when their said frustoconical surface portions are in snug engagement and said end edge surfaces of said form sections are in abutment.