July 25, 1961 G. E. PERKINS ET AL 2,993,257

TRAIL FORMS FOR PAVING MACHINES

Original Filed May 8, 1956 2 Sheets-Sheet 1

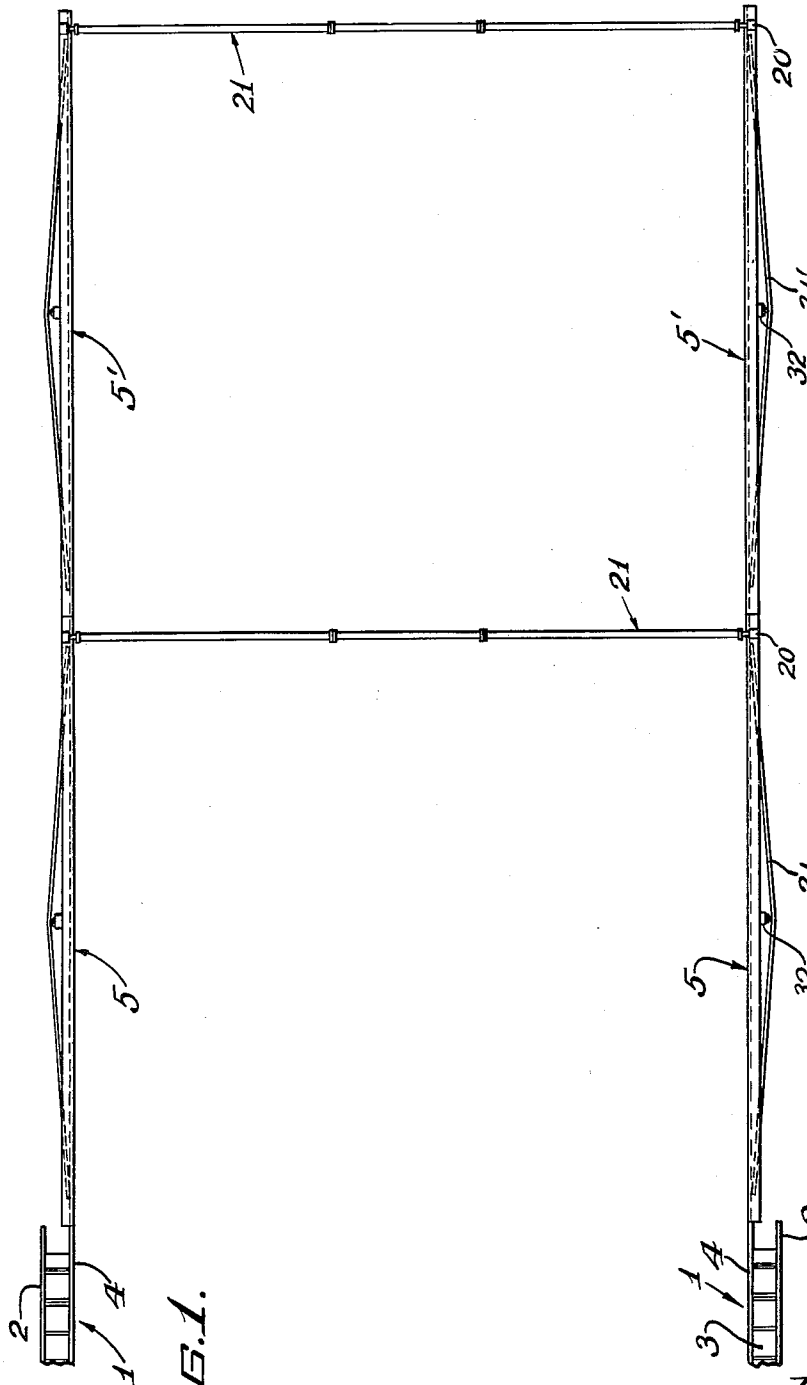


FIG. 1.

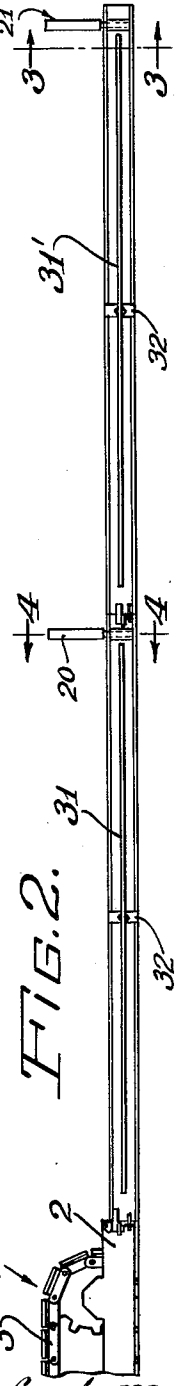


FIG. 2.

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FIG. 3.

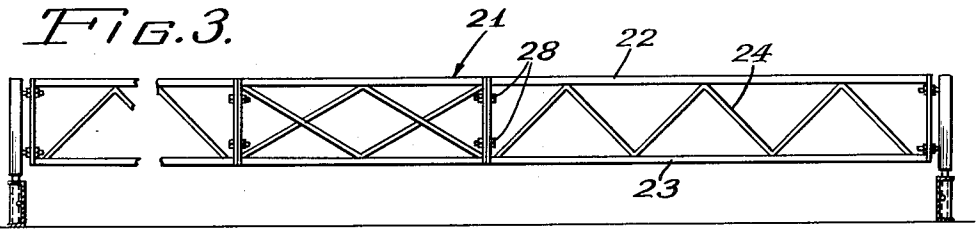


FIG. 4.

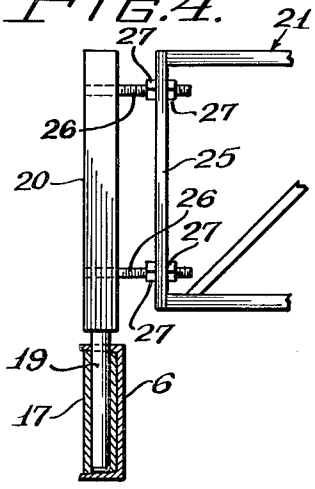


FIG. 5.

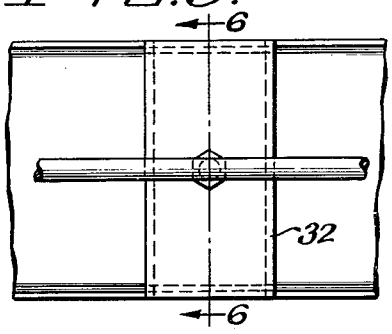


FIG. 6.

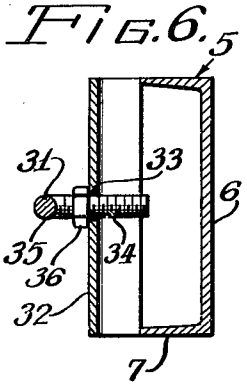


FIG. 7.

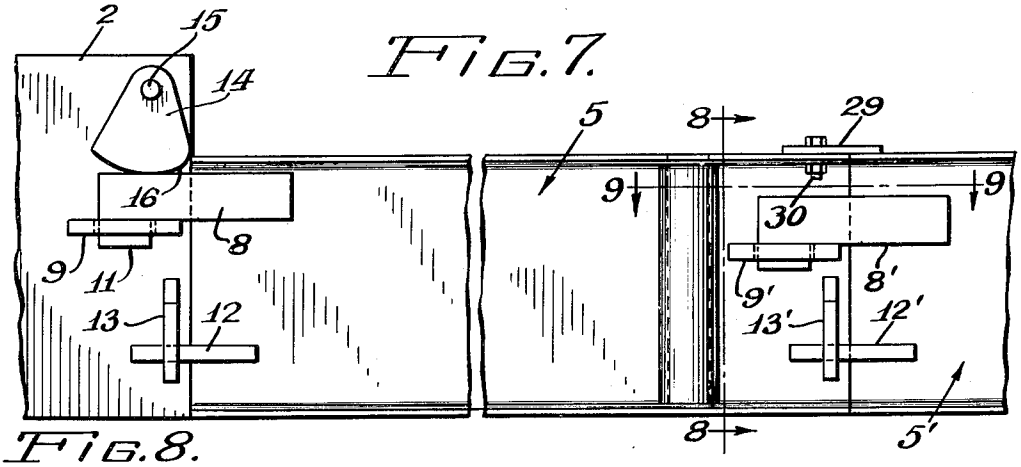


FIG. 8.

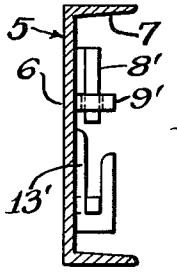
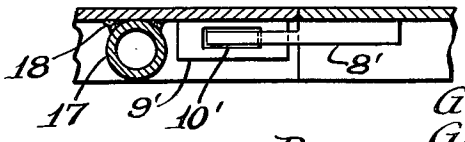


FIG. 9.



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United States Patent Office 2,993,257 Patented July 25, 1961

2,993,257

TRAIL FORMS FOR PAVING MACHINES

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Continuation of application Ser. No. 583,541, May 8, 1956. This application May 25, 1960, Ser. No. 31,783
4 Claims. (Cl. 25—118)

This invention relates to improvements in forms for confining the lateral edges of newly formed paved roads or the like, and refers particularly to spaced forms which may be pulled along the lateral edges of a newly formed pavement by the machine which lays the pavement.

This application is a continuation of our application Serial No. 583,541, filed May 8, 1956, and now abandoned.

For convenience in description, the forms embodying the present invention will be hereinafter referred to herein as "trail forms," the expression being used in the sense that the forms trail or follow a paving machine.

In the copending patent applications filed in the names of Perkins and Dale Serial Nos. 462,309 and 510,928, respectively filed on October 14, 1954, and May 25, 1955, the latter application now abandoned, a road making machine is described which carries its own spaced forms which move over the road site along with the machine and between which the paving material is laid. In the laying of concrete pavements a predetermined minimum time is necessary after the pavement is laid for the concrete initially to set, that is, before flow or slumping is inhibited. Hence, it is desirable that the lateral edges of a newly laid pavement be supported until this setting time has expired. During the pavement laying operation the lateral edges of the pavement are supported by the slip forms of the paving machine. However, for economical operation the machine must be operated at such a rate of travel that the slip forms of the paving machine must leave the lateral edges of the newly laid pavement before the concrete has initially set.

The present invention contemplates a set of trail forms which may be secured to the trailing ends of the paving machine's slip forms whereby the lateral edges of the pavement, before initial set has occurred, will be supported by the trail forms.

One of the objects of the present invention resides in the provision of a set of trail forms which may be quickly and conveniently secured together and to the slip forms of the paving machine, the means of securement being such that the trail forms may articulate with respect to each other and with respect to the slip forms both in a horizontal and vertical plane.

Another important object of the present invention resides in simple and conveniently adjusted means for squaring the vertical surfaces of the trail forms so that the lateral edges of the pavement are maintained in square relationship to the surface of the pavement, said means also being employed to properly space the trail forms on the opposite lateral edges of the road.

A further important feature of the invention resides in means for flexing the individual trail forms intermediate their length.

Other objects and advantages of the present invention will be apparent from the accompanying drawings and following detailed description.

In the drawings:

FIG. 1 is a top plan view of a set of trail forms embodying the concepts of the present invention.

FIG. 2 is a side elevational view of the forms shown in FIG. 1.

FIG. 3 is a slightly enlarged transverse sectional view taken on line 3—3 of FIG. 2.

FIG. 4 is an enlarged detailed sectional view taken on line 4—4 of FIG. 2.

FIG. 5 is an enlarged detailed view of a flexing rod which bears upon one of the forms.

FIG. 6 is a sectional view taken on line 6—6 of FIG. 5.

FIG. 7 is a side elevational view illustrating the securing means employed to secure a trail form to a paving machine slip form and the means for securing a trail form to an adjacent following trail form.

FIG. 8 is a detailed sectional view taken on line 8—8 of FIG. 7.

FIG. 9 is a detailed sectional view taken on line 9—9 of FIG. 7.

Referring in detail to the drawing, 1 indicates the trailing end portion of a paving machine of the type described in the copending applications for patent of Perkins and Dale, aforesaid. The paving machine described in said patent applications is of the type which carries its own forms between which the paving material is laid to form a paved slab, the paving machine forms, or slip forms, functioning to laterally confine the paving material and define the lateral edges of the slab as the machine moves along the road site. In FIGS. 1 and 2, the reference numeral 2 indicates the trailing ends of the paving machine slip forms, the machine being propelled by movable tracks or crawlers 3. The reference numeral 4 in FIG. 1 indicates the opposed surfaces of the slip form which confines and defines the opposite lateral edges of the pavement.

As has been hereinbefore described, the paving material laid by the paving machine requires a minimum period of time to acquire an initial set. If the paving machine is to move forwardly along the road site at an efficient speed, the trailing ends 2 of the paving machine slip forms leave the paved slab before the initial set takes place. Hence, the opposite lateral edges of the newly laid slab are unsupported by the opposed inner surfaces 4 and said lateral edges are likely to flow or slump outwardly.

To combat this difficulty the present invention contemplates the use of spaced trail forms 5. The trail forms, in general, comprise relatively elongated members having substantially flat inner opposed surfaces which are adapted to move along the opposite lateral defining edges of the newly laid pavement and support said edges after the paving machine has moved forwardly. The trail forms illustrated and described herein comprise channel members but it is to be understood that said trail forms may comprise elongated wooden beams or structural metal beams so long as the trail forms have substantially flat inner opposed surfaces which are of sufficient depth to embrace and sustain properly the lateral edges of the newly laid pavement.

Employing trail forms 5, said forms comprise channel members, best illustrated in FIGS. 6 and 8, said channel members having a relatively flat face 6 and flanges 7, the face 6 being adapted to contact the lateral edge of the pavement. In employing the trail forms 5 the flat faces 6 thereof are adapted to be disposed in coplanar alignment with the opposed faces 4 of the slip forms.

To secure the leading end of each trail form 5 to the trailing end of a respective slip form, it is proposed to employ a relatively flat hook-like member 8 which may be welded to the inner face of the web of each channel and which may project beyond the end of the channel adjacent its upper edge. The trailing ends of each slip form 2 carries a loop engagement member 9 which may be secured to the slip form and may be provided with an aperture 10 into which the hook portion 11 of a respective member 8 may engage. In addition, below each hook member 8 a bar 12 may be secured to the leading end of each of the trail forms, said bar projecting beyond said end and being engageable with an open hook member 13 which may be mounted upon the slip form 2.

The trail forms 5 may be secured to the respective ends of the slip forms 2 by engaging the respective members 8

and 10 with the engaging means 9 and 13. To prevent unintended disengagement a segment 14 may be pivotally mounted as at 15 in FIG. 7 upon the trailing end portion 2 of each slip form, the lower end portion of the segment 14 being arcuate, as shown best at 16 in FIG. 7. It can readily be seen that after the members 8 and 12 have been brought into respective engagement with the members 9 and 13 the segment 14 may be swung to the position shown in FIG. 7 and will retain such position by gravity.

In view of the fact that the road site in some instances may curve laterally, it is desirable that the connection between the trail forms and the slip forms be such that a degree of horizontal articulation be permitted. In order to accomplish this result sufficient play is provided between the apertures 10 and in the hooks 13 which will permit a degree of swingable movement of the respective trail forms with respect to the connecting slip forms. In addition, the elevation of the road site frequently varies and hence a degree of vertical articulation is desirable. This articulation is also provided by the play which exists at the ends of the apertures 10 in the engaging members 9 and also by the arcuate surfaces 16 of the locking segments 14. Of course, the radius of curvature of curves in a road are relatively large and also the changes in elevation of a road contemplate large radii of curvature so that the inclinations thereof will be gradual. Hence, the degree of articulation both horizontally and vertically in the connecting members between the trail forms and the slip forms need not be great.

To align the faces 6 of the trail forms with the surfaces 4 of the slip forms is most desirable and inasmuch as the surfaces 4 of the slip forms are substantially square to the upper surface of the pavement, it is desirable that the surfaces 6 of the trail forms also be squared with the upper surfaces of the pavement. To accomplish this end one or more sockets or sleeves 17 (FIGS. 4 and 9) may be sesured to each of the trail forms 5, preferably by welding 18, the axes of the sockets or sleeves being parallel to the face 6 of the trail forms. The sockets 17 are adapted for the slidable reception of alignment pins 19 which may carry upwardly extending bridge-supporting members 20. The bridge-supporting members are adapted to support bridge or spacing beams 21. The spacing beams 21 may comprise built-up members having upper rails 22 and lower rails 23 bridged by reinforcing struts 24. The spacing beams 21 are preferably made in units whereby one or more units may be employed to bridge the distance between opposite trail forms. Each of the units may have opposite terminal bars 25 which are disposed at substantially right-angles to rails 22 and 23.

Each bridge-supporting member 20 carries a plurality of spaced studs 26 which have threaded shanks. The transverse bars 25 may be provided with suitably spaced apertures whereby said bars may be engaged with said studs. The shanks of the studs 26 may be threaded to receive adjusting nuts 27. Where more than one bridge unit is employed the bars 25 of adjacent units may be brought into abutting relationship to each other and may be secured together by bolts 28. However, the endmost bars 25 of the unit or units will engage with the oppositely positioned studs 26 carried by the bridge-supporting members 20.

By the provision of the bridge or spacing members 21, the opposite trail forms may be maintained at a substantially equal distance from each other throughout their length, the bridging members functioning essentially as spacers. However, in order to make the faces 6 of the trail forms substantially vertically parallel to each other the nuts 27 carried upon the opposite studs 26 may be manipulated until the faces 6 of the opposite trail forms are parallel to each other and substanially vertical. By this arrangement the trail forms 5 may be appropriately geometrically oriented with the inner surfaces 4 of the slip forms and also with the lateral edges of the pavement which was defined by the slip form surfaces 4.

When the pavements are not substantially horizontal in highways which are referred to as "super elevated highways" it may be desirable to so adjust the trail forms that their faces are not vertical and the faces of opposite trail forms may not be parallel to each other. In these circumstances, the upper and lower nuts 27 upon the studs 26 carried by the opposite members 20 may be manipulated so as to incline the faces 6 of the trail forms at a desired angle with the vertical.

Depending upon the rate of forward progress of the paving machine and the setting characteristics of the paving mixture, one or more sets of trail forms may be employed. Accordingly, for purposes of illustration a second set of trail forms is shown in the drawings. In view of the fact that the second set of trail forms is identical to the first set, hereinbefore described, corresponding parts of said second set of forms will be designated by primed reference numerals corresponding to like parts in the first set without further detailed description.

When more than one set of trail forms is employed the second trail forms 5' will be secured to the trailing ends of the first forms 5 so as to permit the same degree of articulation, both vertically and horizontally, as is contemplated between the trail forms 5 and the slip forms 2. Thus, the same type of engaging members 8', 9', 12' and 13' are employed, as shown best in FIGS. 7, 8 and 9. However, in view of the fact that the trail forms 5 and 5' are of substantially equal height, a modified form of locking or retaining means is used instead of the swingable segment 14. The locking or retaining means employed between and abutting trail forms comprises a swingable latch bar 29 which may be pivotally secured to the top of one of each pair of trail forms by means of bolt 30, preferably the leading trail forms of the abutting pair. The securement of the latch bar 29 is not sufficiently tight to prevent the desired degree of articulation between the trail forms, but will prevent the trail form which carries the engaging members 8' and 12' to move upwardly relative to the abutting form to such an extent as to permit unintended disengagement of the engaging member 8'.

All sets of trail forms will be bridged by one or more bridging members 21. However, unless the trail forms are exceedingly long, only one bridging member has been found necessary for each set of trail forms and said bridging member is preferably carried adjacent the trailing ends of the trail form sets, as illustrated in FIG. 1.

As another important aspect of the present invention, each of the trail forms 5 and 5' carry flexing rods 31 and 31', respectively. The rods 31 and 31' extend along the length of the respective forms and are anchored, preferably by welding, at their ends to the outer end portions of the forms. Intermediate the length of each form 30 and 31', a reaction plate 32 is secured, preferably by welding, to the flanges 7 of the forms. Each plate 32 is provided with an aperture 33 (FIG. 6) into which a bolt 34 loosely extends. The head 35 of each bolt is rigidly secured to an intermediate portion of each flexing rod. The shank of each bolt 34 is threaded and is engageable by an adjusting nut 36 which bears upon the outer surfaces of each reaction plate 32.

When the road material is confined between the opposite trail forms, it has not acquired an initial set, which, of course, is the reason for the use of the trail forms, as has been hereinbefore described. Not being initially set, the material has a degree of mobility and, hence, exerts an outwardly directed lateral pressure upon the trail forms. Hence, in many instances this pressure is of sufficient magnitude to cause the trail forms to flex or deflect convex outwardly. This deflection can be resisted by manipulating the nuts 36 to increase the tension of rods 31 whereby, if desired, the trail forms may be maintained in substantially straight condition.

However, it is frequently desirable, particularly when the trail forms move around a curve in the road controllably to flex the trail forms. For example, where the

road curves in a predetermined direction it may be desirable to flex the outer trail forms convex outwardly and to flex the inner opposite trail forms concave outwardly or convex inwardly. Thus, the opposite trail forms more nearly conform to the trace of the road than if they were straight. To accommodate the trail forms to such a condition, the nuts 36 on the outer trail forms may be manipulated to decrease the tension of the flexing rods 31 and permit the lateral force of the road material to flex the outer trail forms convex outwardly. The tension of the rods 31 on the opposite or inner forms may be simultaneously increased to flex the inner trail forms convex inwardly. Thus, the trail forms may conform substantially to the curvature of the road which facilitates the movement of the trail forms and produces a more clean cut finished edge upon the pavement.

We claim:

1. A set of trail forms for confining the lateral sides of a newly laid slab of paving material, said trail forms comprising a pair of relatively elongated beams, means carried at one end of each of said beams for making articulated connection to the trailing ends of the respective spaced slip forms of a movable paving machine between which a slab of paving material has been newly laid, said trail forms having relatively flat faces facing each other which are adapted for coplanar alignment with the respective opposed faces of the paver slip forms, bridging means carried by said opposite trail forms spaced from the ends carrying said articulated connection means, said bridging means comprising a bridge-supporting member carried upon each trail form and extending transversely to the length of said trail form and disposed substantially parallel to the flat face of said trail form, a bridging member for connecting opposite bridge-supporting members, said bridging member comprising a substantially rectangular structure having opposite ends, independent adjustable connecting means carried by each of said bridging members and connected to vertically spaced portions of each opposite bridge-supporting member whereby the flat opposed faces of said trail forms may be spaced a predetermined distance from each other and at a predetermined angle of inclination to each other to align said relatively flat faces of said trail forms with the respective opposed faces of said slip forms, and a tension rod secured at each of its ends to the outer face of each trail form, each tension rod being disposed substantially parallel to the trail form upon which it is carried, and movable means interposed between each tension rod and carrying trail form intermediate its length for controllably separating the tension rod with respect to the carrying trail form to increase and decrease the tension of the tension rod.

2. A set of trail forms for confining the lateral sides of a newly laid slab of paving material, said trail forms comprising a pair of relatively elongated beams, means carried at one end of each of said beams for making articulated connection to the trailing ends of the respective spaced slip forms of a movable paving machine between which a slab of paving material has been newly laid, said trail forms having relatively flat faces facing each other which are adapted for coplanar alignment with the respective opposed faces of the paver slip forms, and a bridging structure carried by said opposite trail forms spaced from the ends carrying said articulated connection means, said bridging structure comprising a bridge-supporting member carried upon each trail form and extending upwardly from said trail form, bridging means connecting opposite bridge-supporting members, independent adjustable connecting means carried by said bridging means and connected to vertically spaced portions of each opposite bridge-supporting member whereby the flat opposed faces of said trail forms may be spaced a predetermined distance from each other and at a predetermined angle of

inclination to each other to align said relatively flat faces of said trail forms with the respective opposed faces of said slip forms, and a tension rod connected at each of its ends to the outer face of each trail form, each tension rod being disposed substantially parallel to the trail form upon which it is carried, abutment means interposed between each tension rod and carrying trail form intermediate its length, and means for adjusting the tension of the tension rod with respect to the carrying trail form to increase and decrease the tension of the tension rod.

3. A set of trail forms for confining the lateral sides of a newly laid slab of paving material, said trail forms comprising a pair of relatively elongated beams, means carried at one end of each of said beams for making articulated connection to the trailing ends of the respective spaced slip forms of a movable paving machine between which a slab of paving material has been newly laid, said trail forms having relatively flat faces facing each other which are adapted for coplanar alignment with the respective opposed faces of the paver slip forms, an upright bridge-supporting member adjacent the opposite end of each of said beams and extending upwardly thereabove, each bridge-supporting member being fixed against lateral movement relative to the respective beam, a rigid bridge member extending between said bridge-supporting members, said bridge member being generally rectangular in form and disposed in a vertical plane with its opposite vertical edges juxtaposed to said bridge-supporting members, and adjustable connecting means securing each end of said bridge member to the respective ones of said bridge-supporting members, said connecting means each comprising a pair of vertically spaced longitudinally extending fasteners secured to one of said members and adjustably connected to the other of said members, said fasteners being individually adjustable relative to said other member to vary the distance between said beams and the dispositioin of said flat faces thereof relative to vertical.

4. Means for adjustably interconnecting a pair of laterally spaced generally coextensive slip forms, comprising a pair of upright bridge-supporting members mounted at corresponding laterally opposed locations on the slip forms and extending upwardly thereabove, means fixedly retaining each bridge-supporting member against lateral movement relative to the respective slip form, a rigid bridge member extending between said bridge-supporting members, said bridge member being generally rectangular in form and disposed in a vertical plane with its opposite vertical edges juxtaposed to said bridge-supporting members, and adjustable connecting means securing each end of said bridge member to the respective ones of said bridge-supporting members, said connecting means each comprising a pair of vertically spaced horizontally extending fasteners secured to one of said members and adjustably connected to the other of said members, said fasteners being individually adjustable relative to said other member to vary the distance between said slip forms and the disposition of said slip forms relative to vertical.

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