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Hixon

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[54] **FORMWORK SYSTEM**

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[52] **U.S. Cl.** ..... **249/194,** 249/45, 249/192, 249/219 R, 249/219 W

[51] **Int. Cl.** **B22d 7/10**

[58] **Field of Search** ..... 249/192, 194, 195, 196, 249/219 R, 219 W, 213, 44, 45

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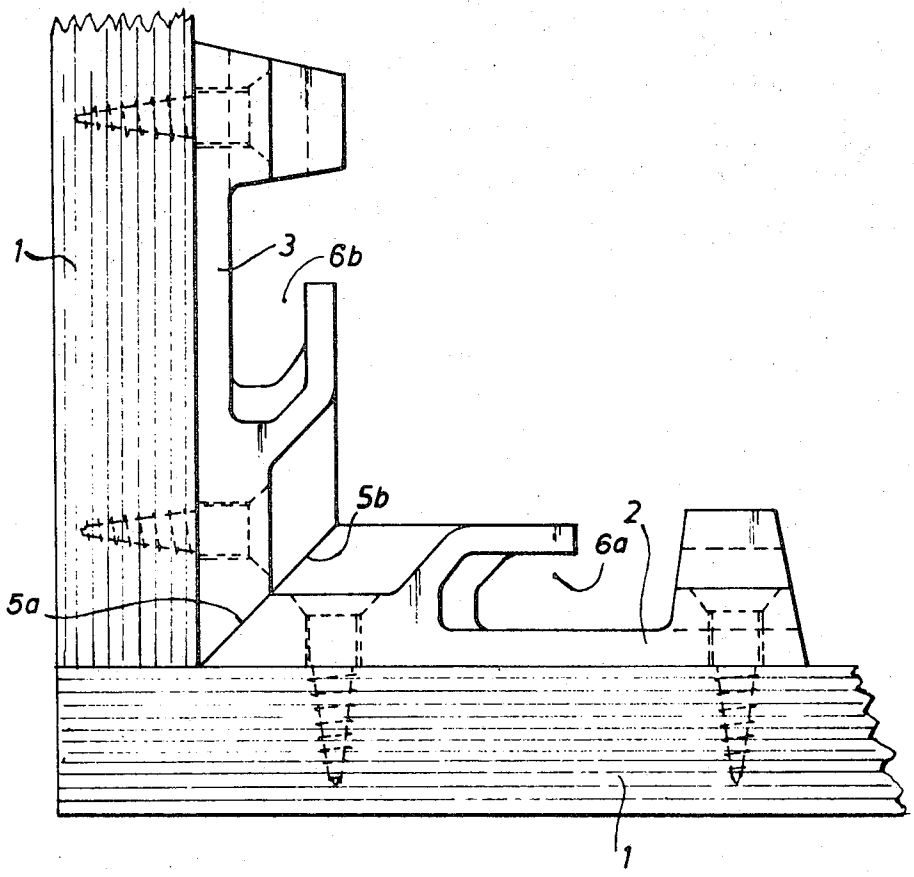
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Assistant Examiner—Ronald J. Shore
Attorney, Agent, or Firm—Michael S. Striker

[57] **ABSTRACT**

The invention relates to a formwork system for in situ concrete casting comprising at least two panels in edge to edge arrangement. To secure the panels together an attachment shoe is secured to one face of each panel adjacent to the edge in question each shoe providing a groove which opens in a direction away from said edge. A shoe clamp is then employed to secure the two shoes together in the correct relative positions, the clamp having ears which locate one in each groove.

8 Claims, 7 Drawing Figures



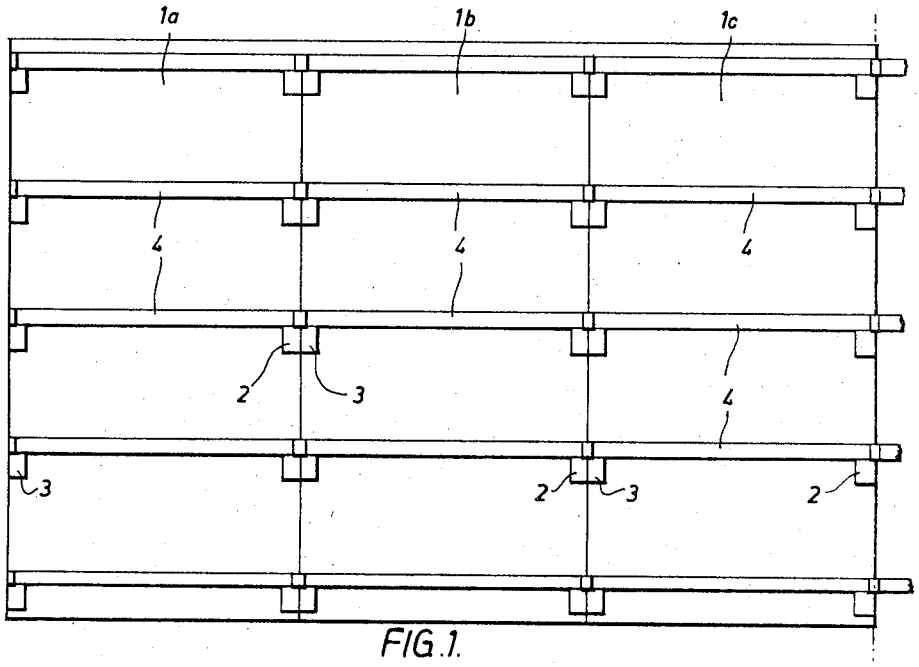


FIG. 1.

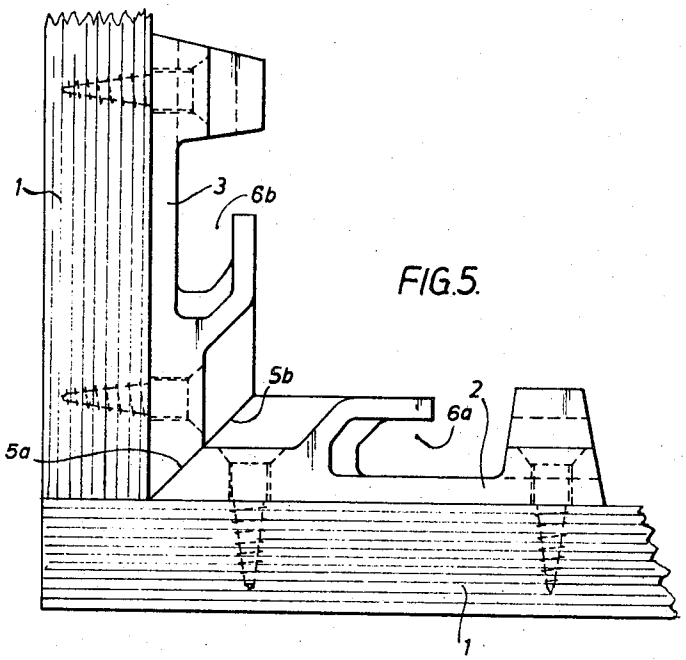


FIG. 5.

FIG.2.

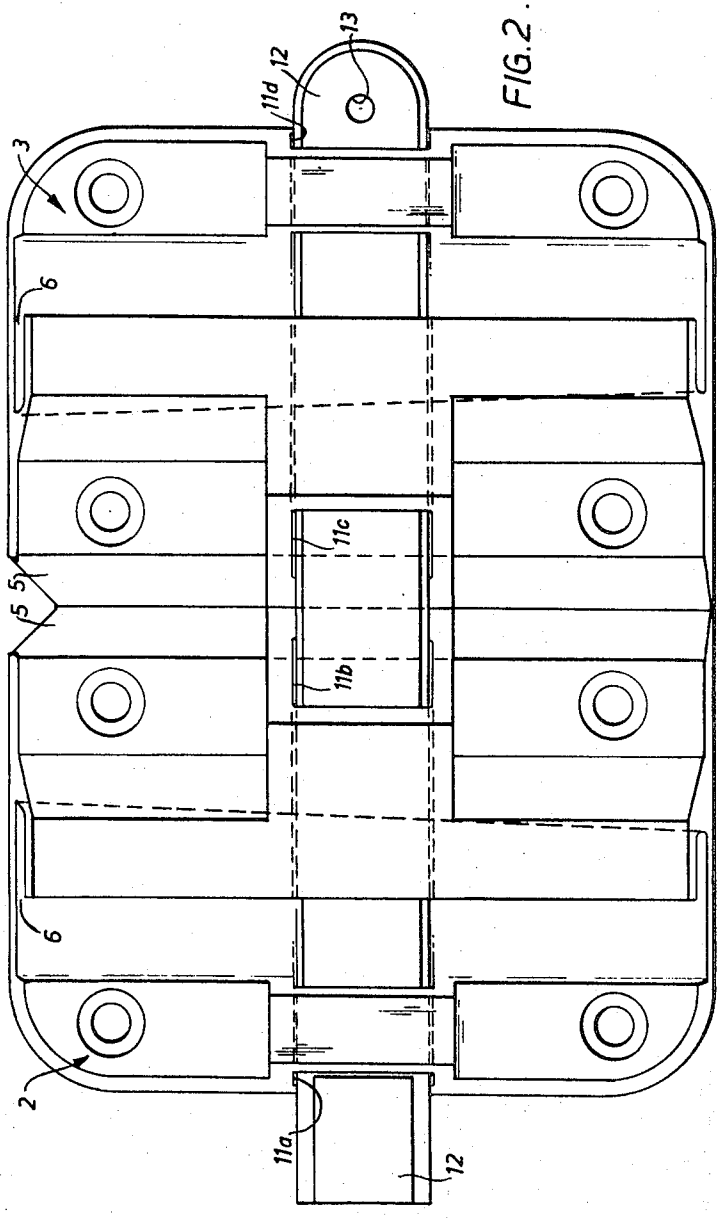
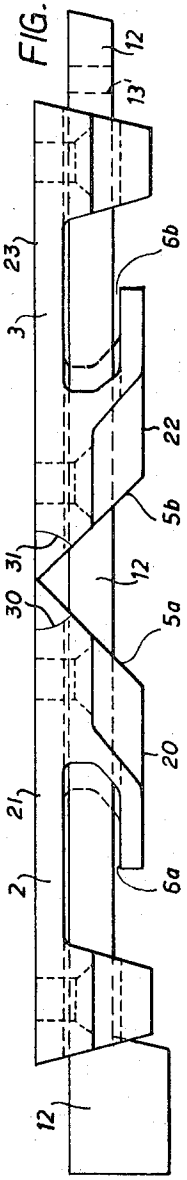

11d
12
13
3
6
11c
11b
5
5
6
2
11a
12

FIG.3.


12
13'
23
3
6b
22
5b
31
12
30
5a
20
21
2
6a
12

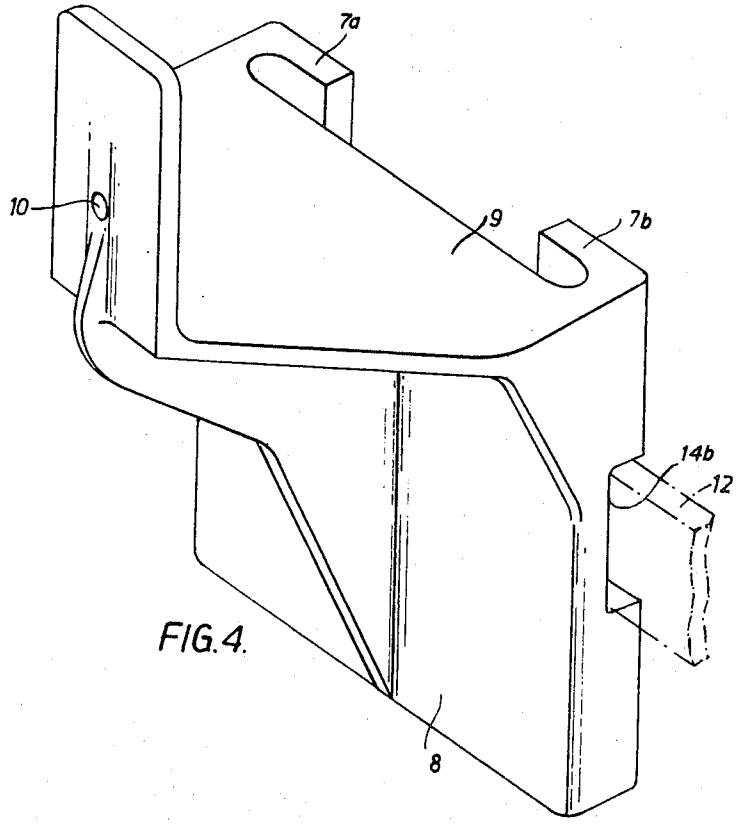


FIG. 4.

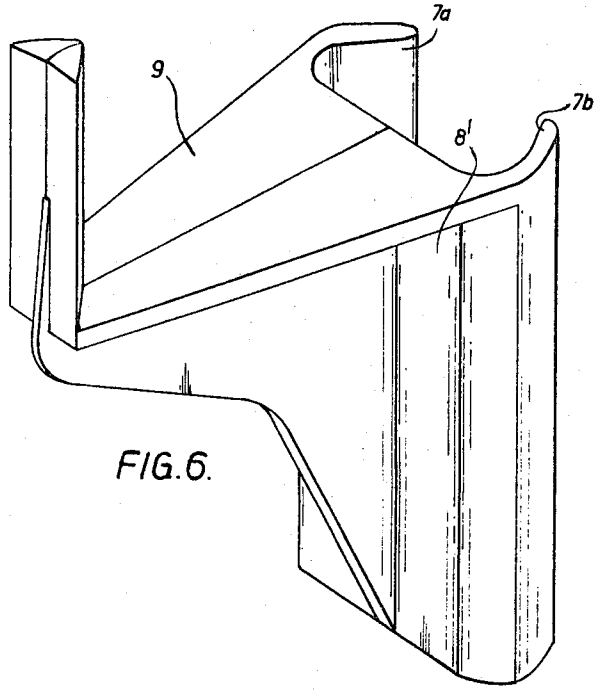


FIG.6.

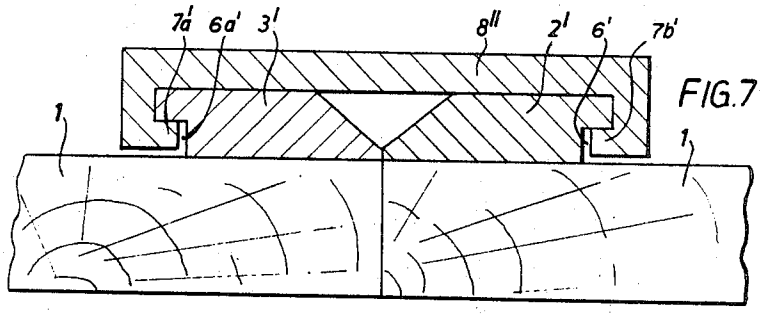


FIG.7

FORMWORK SYSTEM

This invention relates to a formwork system for providing shuttering for the casting of concrete. Formwork systems are known which employ standard, rectangular panels (e.g. of metal or plywood) and these are conventionally supported by a framework so that the panels are disposed in a desired edge-to-edge relationship.

Using conventional formwork systems, the task of erecting the shuttering is time-consuming and unless great care is taken to ensure correct alignment of adjacent panels, the surface finish on the cast structure when the shuttering is removed, leaves much to be desired.

This invention relates to an improved formwork system which seeks to facilitate the erection of the shuttering and at the same time seeks to achieve more accurate alignment of adjacent panels.

According to the present invention a formwork system comprises at least two panels which meet along one edge of each panel, an attachment shoe secured to one face of each panel adjacent to said edge thereof, each shoe providing a groove which opens in a direction away from said edge, and a shoe clamp for bridging between the two shoes when the edges of the panels are disposed in the correct relative positions, the clamp having ears which locate one in each groove, the shoes and clamp being dimensioned so that as the clamp is moved along the grooves it draws the shoes together and thus draws the confronting edges of the panels together.

Conveniently the shoe clamp comprises a support bracket which, when the clamp is secured between two shoes, is spaced from the panels, the support bracket then being available to accommodate a supporting beam (e.g. of timber) against said faces of the panels.

Preferably each shoe includes a recess extending normal to the panel edge and a cotter bar is provided for insertion into the aligned recesses of the two adjacent shoes to ensure correct alignment of one relative to the other. Suitably the cotter bar may act to lock the shoe clamp in position on the shoes.

Preferably the edge of each shoe adjacent to said edge of the panel is chamfered at an angle of 45° to said one face of the panel since this arrangement enables two shoes to be employed for a plane joint between two panels or for a 90° corner joint, merely by modifying the shoe clamp, for the two different cases.

Preferably the shoes are dimensioned so that there is a wedging action between the clamp and the shoes as the former is moved along the grooves in the shoes. This is most easily achieved, in practice, by arranging for the groove in each shoe to be inclined away from said edge of the panel and this means that a left-hand and a right-hand shoe are required for each matching pair which are held together by a shoe clamp.

In a typical formwork system in accordance with the invention the panels would be rectangular sheets of plywood and the shoes would be screwed onto the rear face of the plywood sheets.

One embodiment of framework system in accordance with the invention, will now be described, by way of example, with reference to the accompanying drawings, in which:

FIG. 1 is a rear elevation of a typical make-up showing three rectangular plywood panels held together by a plurality of pairs of clamps,

FIG. 2 shows, on an enlarged scale, a front elevation of one pair of clamps as used in the make-up shown in FIG. 1, but without the corresponding shoe clamp,

FIG. 3 is a plan of the clamps shown in FIG. 2,

FIG. 4 is an isometric view of a shoe clamp for use with the pair of shoes shown in FIG. 2,

FIG. 5 shows how the clamps of FIG. 2 can be employed to define a 90° corner,

FIG. 6 is an isometric view of a modified shoe clamp for use with the arrangement of shoes shown in FIG. 5, and

FIG. 7 is a sectional elevation through a modified pair of shoes and an associated shoe clamp.

Referring to FIG. 1, the formwork system comprises rectangular plywood panels 1 (in the illustrated embodiment these are 8 feet by 4 feet) and the panels are held together in co-planar relationship by pairs of shoes 2 and 3 and by horizontal timbers 4.

The shoes 2 and 3 are illustrated in FIGS. 2 and 3 and are used in conjunction with the clamp shown in FIG. 4. The shoe 2 is a left-hand shoe and the shoe 3 is a right-hand shoe, these two shoes being screwed to the rear surface of the panels 1 so that chamfered edges 5*a*, 5*b* thereof are aligned with the edges of the panels which are to be brought into abutment. Each shoe defines a groove 6*a*, 6*b* each of which grooves tapers away from the chamfered edges 5*a*, 5*b* respectively in the downward direction, the positioning of the grooves 6*a*, 6*b* on the pair of shoes 2 and 3 being such that engaging portions 7*a*, 7*b* of a clamp 8 (see FIG. 4) can be located in the grooves 6*a* and 6*b* respectively and can, by moving the clamp 8 in the downward direction relative to the shoes 2 and 3, draw the chamfered edges 5*a*, 5*b* close together (and thus bring the confronting edges of the panels 1 into abutment).

The clamp 8 carries a bracket 9 which serves to support the timber 4. The dimensions of the bracket 9 are conveniently such as to allow the use of standard timber pieces for the timbers 4. The hole 10 provided in the bracket 9 allows the timbers 4 to be nailed or screwed in place after assembly.

The shoes 2 and 3 and the clamp 8 are provided with horizontal recesses 11*a* through 11*d* and 14*a* and 14*b* respectively when the panels 1*a* and 1*b* are correctly positioned one relative to each other with the clamp 8 in place over the shoes 2 and 3, the recesses 11*a* and 11*b* in the two shoes of each pair and the recesses 14*a* and 14*b* in the clamp 8 are all being aligned to receive a cotter bar 12. The cotter bar is provided with a hole 13 enabling the cotter bar to be nailed or screwed into the rear surface of a panel should it be desirable to prevent inadvertent removal of the cotter bar. It will be appreciated that the cotter bar serves to lock the clamp 8 in position over the shoes 2 and 3 thus ensuring that the formwork system can only be dismantled after the cotter bar has been removed.

FIG. 5 shows how the shoes 2 and 3 can be employed to support two panels 1 in a 90° relationship. For this purpose, the shoe 3 is disposed with the chamfered edge 5*b* aligned with the edge of the panel but the shoe 2 is disposed so that its chamfered edge, although parallel with the edge 5*a* of the nanels, is spaced inwardly from the edge by a distance corresponding to the thickness of the panel 1. When the shoes 2 and 3 are em-

ployed in the manner shown in FIG. **5** a modified clamp **8'** as shown in FIG. **6** is required. This modified clamp **8'** also has engaging portions **7***a*, **7***b* for location in the grooves **6***a*, **6***b* and defines a bracket **9** for supporting the timbers **4.**

The initial fixing of the shoes to the rear surface of the panels **1** can conveniently be effected while the panels are held in the desired co-planar or 90° relationship and it may be desirable to secure the clamps in place between the shoes (and in the case of the co-planar relationship also to locate the cotter bar in position) before the shoes are attached to the rear surface of the panels. (The outer pair of fixing holes in each shoe are accessible for screws when the clamps **8** or **8'** are in position). It will be appreciated that once the shoes are in position they can be left in position until the panel has served its useful life.

The formwork system described can be erected quickly to define accurate shuttering for pouring concrete and, when the concrete is set, can be removed merely by removing the timbers **4,** the cotter bars **12** and the clamps **8.** Alternatively two or more panels **1** can be moved together, with the bracing timbers left in place, and repositioned at a new place on a site.

Although I prefer the engaging portion-receiving groove in each shoe to be defined wholly by the shoe, I do not rule out the possibility that each groove may, in part, be defined by the panel to which a shoe is attached.

FIG. **7** shows a sectional elevation of a modified pair of shoes **2'** and **3'** and an associated shoe clamp **8''**, in which the grooves **6'***a*, **6'***b* are defined on one side by the panels **1.** The shoe clamp **8''** has an engaging portions **7'***a*, **7'***b* on each side thereof.

The shoes, clamps and cotter bars can suitably be castings of any suitable metal or alloy.

What is claimed is:

1. A framework system for connecting a pair of framework panels in either coplanar or mutually trasnverse relationship, comprising a connecting unit having a single left-hand first attachment shoe having a first front face, a first rear face and a right-hand beveled edge subtending an acute angle with said first rear face, said first shoe being formed with a first groove; a single right-hand second attachment shoe having a second front face, a second rear face, and a left-hand beveled edge subtending an acute angle with said second rear face, said second shoe being formed with a second groove; a first and a second framework panel, each of said panels having at least one edge and at least one major surface; means on said shoes for securing each of said shoes to a respective one of said framework panels, so that the rear surface of each of said shoes is in contact with said major surface of the associated panel; and a pair of alternately usable shoe clamps, including a first shoe clamp for bridging said first and second grooves only when said rear faces of said shoes and therefore said framework panels are substantially coplanar, and a second shoe clamp for bridging said first and second grooves only when said rear faces of said shoes and therefore said framework panels extend transversely to one another, each of said shoe clamps being formed with engaging portions which are spaced apart from each other and receivable in said first and second grooves, respectively, for urging the beveled edges of said shoes together as the respective clamp moves along said grooves, while the engaging portions of said respective clamp are received in said first and second grooves, respectively.

2. A framework system comprising a left-hand first attachment shoe having a first front face, a first rear face and a right-hand beveled edge subtending an acute angle with said first rear face, said first shoe being formed with a first groove; a right-hand second attachment shoe having a second front face, a second rear face and a left-hand beveled edge subtending an acute angle with said second rear face, said second shoe being formed with a second groove; each of said shoes being additionally formed with a longitudinal passageway in a direction transverse to the elongation of the respective beveled edge and substantially parallel with the rear face of the respective shoe, said passageway intersecting the respective groove; a first and a second framework panel, each of said panels having at least one edge and at least one major surface; means on said shoes for securing each of said shoes to a respective one of said framework panels, so that the rear surface of each of said shoes is in contact with the major surface of the associated panel; a pair of alternately usable shoe clamps, including a first shoe clamp for bridging said first and second grooves when said rear faces of said shoes are substantially coplanar and having engaging portions spaced apart from each other and respectively slidably receivable in said grooves, and a recess behind each of said engaging portions, said recesses being aligned with said passageways when said shoes are clamped together and the rear faces of the respective shoes are substantially coplanar, and a second shoe clamp for bridging said first and second grooves when said rear faces of said shoes extend transversely to each other, and also having engaging portions which are spaced apart from each other and slidably receivable in said first and second grooves, respectively, and a cotter bar slidable into said passageway and into said recesses which are aligned therewith for locking said first clamp onto said shoes.

3. A formwork system as claimed in claim **1,** further comprising a support beam, and at least one of said shoe clamps including a portion forming a bracket for accomodating said support beam.

4. A formwork system as claimed in claim **1,** wherein said groove of each shoe extends substantially longitudinally of and faces away from the respective beveled edge.

5. A formwork system as claimed in claim **1,** wherein said acute angle of each beveled edge is substantially 45°.

6. A formwork system as claimed in claim **1,** wherein the beveled edges of the respective shoes are in line contact with each other when the respective clamp is in position bridging said first and second grooves.

7. A formwork system as claimed in claim **1,** wherein said engaging portions are formed as ears.

8. A system as claimed in claim **1,** at least one of said clamps having a surface which extends substantially perpendicular to the direction of movement of the respective clamp along said grooves and which does not intersect with said shoes, whereby an impact tool can be brought to bear on said surface for moving the respective clamp along said grooves.

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