May 6, 1969 J. G. PREBLICH 3,442,482

FORM CLAMP

Filed Dec. 3, 1965

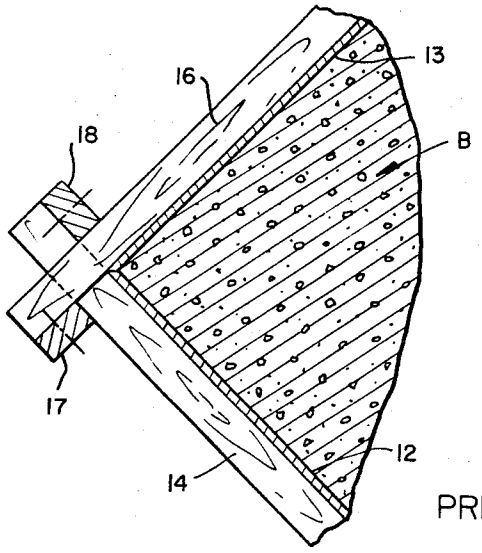
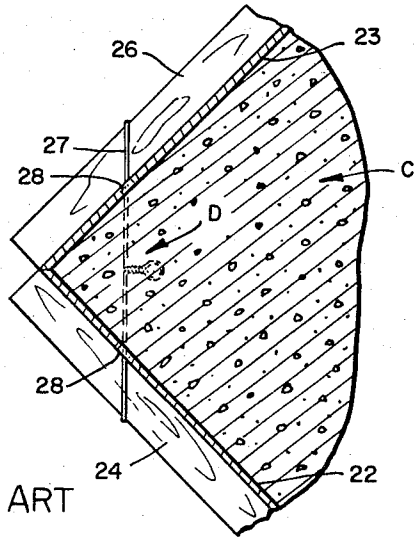


FIG_1A



PRIOR ART

FIG_1B

FIG_4

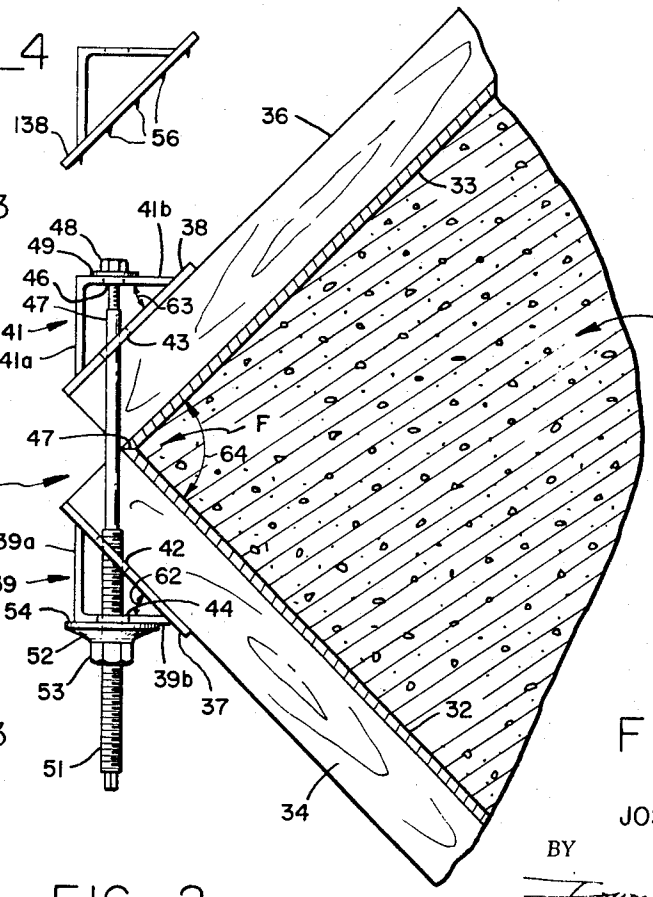


FIG_2

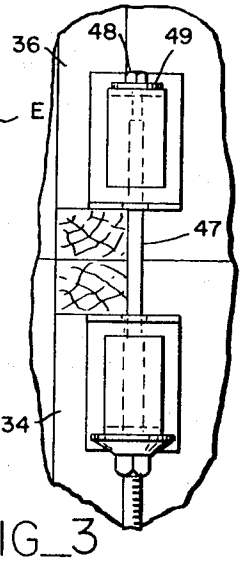


FIG_3

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FORM CLAMP

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U.S. Cl. 249—219 2 Claims

ABSTRACT OF THE DISCLOSURE

A mold support corner clamp is disclosed comprising a pair of plates adapted to bear flatly against the outer two surfaces of a pair of workpieces disposed at an angle to each other, a back plate secured to each of said plates at an angle to align the back plates substantially parallel to each other when the plates are positioned for bearing contact against the outer two surfaces of said workpieces, and removably adjustable compression means mounted and bearing against the back plates for compressing the workpieces.

This invention relates to a clamp and more particularly to a clamp which may be used to support two members, such as the walers of a concrete form structure, at right angles to each other.

Although my invention may be used in a number of applications where it is desirable to secure two adjacent members at right angles to each other, I have found it to be of particular interest in concrete form construction. In constructing forms for the pouring of concrete, boards or plywood panels are held in place by external reinforcing supports known as walers. These members are usually standard 2 x 4's or other convenient stock timber selected to have sufficient stiffness to support and reinforce the boards or plywood panels against the pressure of the wet concrete being held in place prior to the initial hardening or curing period.

A problem that frequently occurs in the above-described form construction utilizing walers and the like is the placement and support of two forming surfaces having edges which abut against each other to form a corner. In FIGS 1A and 1B of the drawing accompanying this specification, I show two typical prior art solutions to this problem. In the sectional plan or elevational view of FIG. 1A, poured concrete indicated generally at B is held in place by form boards **12** and **13** which in turn are backed up and supported by walers **14** and **16**. These members are in turn held in place by so-called "kickers" **17** and **18** which may be secured by nailing or other suitable fasteners to walers **16** and **14**, respectively. Thus kicker **17**, which, for example, may be a 2 x 2 timber, restrains waler **14** and form board **12** from movement away from the zone of concrete pouring, and kicker **18** restrains waler **16** and board **13** from similar movement. This type of form construction, however, has several disadvantages; for example, it is relatively difficult to obtain good alignment of the walers supported form boards since it is necessary to nail or bolt some of the kickers while holding the adjacent walers in final assembly position. This method also requires extra material for kickers, two for each corner, which are usually provided along each waler intersection; and the walers themselves must extend out beyond the corner of the intersection of the concrete forms to provide stock for nailing or bolting up the kickers. Also, particularly when nailing is used, the walers are often split and cannot be reused after ripping down the forms. Another disadvantage is that labor costs are relatively high for this type of form construction because of the necessary interconnection of kickers and walers which may

occur as often as every two feet throughout the entire length of a given form corner.

Another prior art solution with which I am familiar is shown in the sectional view of FIG. 1B where walers **24** and **26** reinforce forms **22** and **23** to constrain the concrete indicated generally at C. Here the walers are held in place by heavy flexible wire **27**. The wire is wrapped around and passed between the walers through holes **28** formed in form boards **22** and **23**. The heavy wire may be twisted or drawn together in some other manner either within the concrete zone as indicated at D or outside adjacent to one of the walers. One of the disadvantages of this method is that the holed in forms **22** and **23** ordinarily require caulking prior to the pouring of concrete to avoid protrusions of concrete along the finished wall. Where extensive corner forming is required, such caulking, and the necessity of cutting and trimming member **27** after the pouring and stripping of the form, increases costs substantially.

It is a primary object of the present invention to provide a pair of bearing plates to bear flatly against the outer two surfaces of a pair of workpieces which are disposed to one another at a predetermined angle. A back plate is secured to each of the bearing plates at an angle which will align the back plates so that they are substantially parallel to each other when the bearing plates are positioned for bearing contact against the outer two surfaces of the workpieces. Compression means is provided with the device for urging each of the back plates and consequently each of the bearing plates toward each other so that the bearing plates are tensioned against the outer surfaces of the workpieces and held in clamped relationship.

It is another primary object of the present invention to provide a corner clamp for holding a pair of workpieces which workpieces are so positioned relative to one another so as to define the apex of a predetermined angle. Such a corner clamp comprises a pair of plates having bearing surfaces for engaging the workpieces therebetween. A first leg is secured to one of said plates and a second leg is secured to the other of said plates so that the legs and plates form a pair of angles the sum of which is substantially equal to the predetermined angle of the workpieces. The device also includes compression means which is operatively connected to the legs for moving the legs into and out of bearing contact with the workpieces. The compression means comprises a "she" bolt inserted through each of the legs together with a bearing nut threadedly secured to one end of the "she" bolt and stop means secured to the other end of the "she"bolt.

It is another object of this invention to provide a reusable corner clamp to secure and hold members such as walers and concrete forms at right angles to each other while eliminating the need of additional structural members and associated construction operations.

A feature and an advantage of this invention is that the clamps themselves are reusable. Also, the need for kickers is eliminated altogether while the forming materials, such as walers, are minimized; left undamaged by the clamps; and hence are also reusable on future jobs.

It is another object of this invention to provide a corner clamp comprising a pair of clamping plates slidably mounted along an elongate rod. The plates are oriented so that their faces are at right angles to each other, and the rod is provided with a stop at one end and an adjustable cathead or bearing bolt at the other end. The plates may be placed in position bearing along the outside faces of a pair of adjacent walers at right angles to each other and then drawn together by means of the bearing bolt so that the walers are securely supported by the faces of each of the clamps at right angles to each other. During tightening of the clamping plates, the clamp itself may

be supported in position by means of the elongate rod resting on adjacent walers.

A feature and an advantage of this invention is that any number of corner walers may be secured in fixed relative position to each other without the use of additional structural members such as kickers or the like which not only require additional material but relatively extensive labor of installation and adjustment as well.

It is another feature and advantage of my invention to provide a corner clamp for concrete forms which eliminates the need for drilling holes in the form boards to accommodate clamping members of the twisted wire variety and the need for caulking such holes or trimming the concrete protrusions, and cutting the wires extending from the finished wall, which remain after pouring and stripping away of the forms.

Another object of my invention is to provide a corner clamp having a pair of clamping plates with L- or angle-shaped brackets having legs secured to one side of each of the plates. An opening is formed in the face of each of the plates which is in alignment with a similar such opening in one of the legs of the L-shaped bracket. An elongate rod or "she" bolt is provided which may be positioned through the holes in the clamp plates and brackets. One end of the rod is provided with a flange and the other end with an adjustable bearing bolt or cathead. The clamping plates may be aligned at predetermined angles to each other and positioned to contact the backsides of a pair of walers set up to support form boards abutting each other at an angle equal to the sum of the predetermined angles. The adjustable bearing nut at the one end of the rod may be turned to vary and fix the maximum interval between the clamping plates and their attached brackets; in this way the walers may be secured and clamped in fixed operating position.

A feature and an advantage of my invention is that the clamp may be used to hold the corners of angle-abutting form boards which do not require the use of walers. In such case it is merely necessary to provide filler blocks under the clamp faces to provide clearance of the elongate rods at the outside edge of the form corner. The clamps may then be applied along the entire length of the form corner as required.

Turning now to the drawings, FIGS. 1A and 1B are sectional views showing concrete forms held in place at a right angle corner by certain prior art structures as explained above;

FIG. 2 is a sectional view of a concrete corner forming assembly embodying my invention;

FIG. 3 is a side elevation taken along line 3—3 of FIG. 2; and

FIG. 4 shows a portion of my invention in side elevation with certain details clarified.

My invention is best understood by referring to FIG. 2 and the clamp indicated generally at D. Although my novel clamp may have a variety of applications, I show it as applied to walers at the corner of a concrete form bounding the concrete zone indicated at E.

Forms **32** and **33**, which may be made of boards in end-to-end relationship or abutting plywood panels, are held in place before the pouring of the concrete. The form boards or plywood paneling are backed up and reinforced in place by walers **34** and **36** which may be fabricated of standard 2×4 timbers or other suitably sized members made of wood or other material. Such walers are generally required at relatively frequent intervals along the entire length of the forming structure, including the corner shown at F, to back up and reinforce forms **32** and **33** against the high fluid pressures exerted by the fresh concrete when poured in the zone at E.

To firmly hold and clamp members such as walers **34** and **36** in place, my novel clamping device provides a pair of clamping plates **37** and **38** positioned to bear on the backsides of pairs of such adjacent corner walers. The

plates may be drawn together along rod **47** by means of bearing nut or cathead **52** which can be threadedly advanced along the rod in bearing contact with back plate **39***b* secured to plate **37**. Plate **38** is restrained by means of flange washer **49** under cap screw **48**. While clamp plates **37** and **38** are loose, the entire clamp assembly may be supported in position by resting elongate rod **47** on the end surfaces of walers **34** and **36**. In some cases it may be desirable to use pairs of walers to reinforce the form boards, in which case the clamp rod may be nested between the walers thus imparting additional stability to my novel clamping arrangement.

L-shaped brackets or angle members indicated at **39** and **41**, having leg members **39***a* and **39***b*, and members **41***a* and **41***b*, respectively, are provided with the ends of the leg members welded or otherwise suitably secured to the backs of the plates indicated at **37** and **38**, respectively. Legs **41***a* and **41***b*, and the portion of plate **38** between the legs **39***a* and **39***b*, and the portion of plate **37** between the latter legs, are arranged here to form an isosceles right triangle. The hypotenuse of each triangle is that portion of the clamping plate between equal legs **41***a* and **41***b*, and **39***a* and **39***b*. An elongate opening **42** is formed in the face of plate **37** and a similar such opening **43** is formed in the face of plate **38**. A more or less circular opening **44** is formed in leg **39***b* of the bracket indicated at **39**, and a similar opening **46** is formed in back plate **41***b* of the bracket indicated at **41**. The alignment of openings **42** and **44** is parallel to leg **39***a*, while that of openings **43** and **46** is parallel to leg **41***a*.

An elongate rod or "she" bolt **47**, which is shaped to fit through the openings **44**, **42**, **43** and **46**, is positioned through these holes with the outside faces of plates **37** and **38** positioned to contact the backs of walers **34** and **36**, respectively. A flat washer **49** is provided under cap screw **48** which is threadedly engaged in a longitudinal hole at one end of "she" bolt **47**. The flat washer prevents passage of the cap screw head through opening **46**. Coarse square threads **51** are provided at the other end of bolt **47** and threadedly engage the internal threads of cathead **52** having wrench flats **53** and flared bearing portion **54**.

With the alignment of holes **44** and **42** parallel to leg **39***a* of L-shaped bracket **39**, and that of holes **43** and **46** parallel to leg **41***a* of bracket **41**, the face of clamping plate **37** may be aligned at right angles or normal to the plane of the face of plate **38**. By this arrangement, both plates are maintained normal to each other as the plates are drawn together during clamping by turning cathead **52**, by suitable means such as a wrench engaged against wrench flats **53**. As the interval between the plates is varied to fix the maximum interval therebetween, the clamp faces in contact against the backs of the walers force the walers close together thereby forming a tight connection along the intersection indicated at F.

The above described arrangement embodying my novel invention may be repeated throughout the concrete form construction wherever corners must be set up with forms to restrain the flow of wet concrete prior to setting-up and initial curing. Thus it is understood that my invention may be employed along the waler reinforced intersection of form boards at any angle in respect to the horizontal, i.e., vertical, horizontal, or at angles in between.

After the concrete has set-up, and the forms are to be stripped, it is a relatively simple matter to loosen my novel clamps and free the walers and form boards. Substantial savings are thus realized using my invention, since the need for prying apart nailed walers, or unbolting the several connections of bolted members, is avoided. In addition, no walers are lost due to splitting during the stripping operation, or the virtual destruction of a waler end once a hole has been drilled therethrough to receive a bolt. Additional material in the way of kickers is eliminated; and, in contrast to wire tying of the walers through the concrete zone, explained earlier, my invention avoids costly caulking and trimming operations necessitated by

such techniques. Moreover, the novel clamps of my invention, which eliminate the relatively costly and labor-consuming techniques just described, are in no way damaged by use and may be reused repeatedly in job after job, thus achieving even further convenience and economy of operation.

It is also understood that my novel clamp arrangement may be applied to angle-abutting form boards which do not require the use of reinforcing walers. In such case it is merely necessary to plate spacer blocks between the clamping faces and the form boards to provide clearance and locate the "she" bolt beyond the corner of the form structure.

I have described my invention in the foregoing specification in some detail, but this is understood to be for the purpose of clarity of explanation and is not intended to impose unnecessary limitation. For example, I have described my novel clamping arrangement as applied to right angle corners for the sake of convenience. By changing the length of the legs of the brackets indicated at **39** and **41**, other angular relationships may be accomplished between the faces of clamping plates **37** and **38**, e.g., almost any angle from a very acute angle to an obtuse angle may be formed between the clamp plates and hence the concrete form boards. In general my novel clamp may be used to hold workpieces such as walers **34** and **36** shown in FIG. 2 at any desired predetermined angle therebetween so long as the leg secured to one clamp plate, for example leg **39***b* secured to plate **37**, is arranged parallel to the leg on the other clamp plate, in this case leg **41***b* secured to plate **38**. This construction is also characterized by the sum of the angles between the legs and the respective plates to which they are secured, for example the sum of angles **62** and **63**, being substantially equal to the angle between the workpieces, i.e., angle **64** in the case of walers **34** and **36**.

In the event that the angle between workpieces is selected to be greater than 90°, i.e., an obtuse angle, it may be necessary to provide some means to assist the face of the plates to dig in and grip the backs of the walers. This may be accomplished by barbs or sharp protrusions **56** on face **138** of a typical clamp as shown in FIG. 4. Sharp protrusions **56** that project outwardly from the face of the plate preferably are aligned at an angle generally inclined in the direction of the clamping motion of the plates when in operation. Such barbs or protrusions may also be useful even for right angle or acute angle concrete form corner construction.

Many other mechanical variations may occur to one skilled in the art upon a reading of this specification which are within the spirit of my invention and scope of the appended claims.

What is claimed is:

1. In combination with a pair of abutting workpieces disposed at an angle to each other that are suitable for being held in direct contact with wet concrete during the initial hardening period for said concrete, a corner clamp arranged to temporarily rigidly align said workpieces, comprising in combination: a pair of clamping plates, each including a face adapted to bear flatly against a respective outer surface of said pair of abutting workpieces, said faces including a plurality of protrusions projecting outwardly therefrom for penetration into respective of said workpieces; a pair of L-shaped backing plates secured at their outer ends to respective of said clamping plates, said backing plates each having a pair of interconnected legs, a leg of one of said backing plates adapted to be substantially parallel to a leg of the other of said backing plates when the clamping plates are positioned to bear against the outer surfaces of said workpieces; compression means including an elongate rod spaced from said workpieces and adapted to be aligned within and extend from openings formed in said parallel legs and said clamping plates, said openings having centers in alignment with each other and normal to the faces of said parallel legs when said clamping plates are positioned for bearing contact against the outer surfaces of said workpieces, said rod being threaded at both ends, and a pair of threaded members adapted for independent mating engagement with respective ends of said rod, said threaded members having a bearing face for contacting the outer face of respective of said parallel legs, said pair of threaded members being separately adjustable so that the forces being applied to both of said workpieces by said clamping plates can be substantially equalized to retain said workpieces at said angle to each other.

2. A corner clamp in accordance with claim **1** wherein one end of said rod is internally threaded while the other end of said rod is externally threaded.

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