United States Patent

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[54] **CONCRETE COLUMN FORM CLAMP AND METHOD**
12 Claims, 9 Drawing Figs.

[52] **U.S. Cl.** ..... **269/121,** 269/9, 269/124, 269/141, 269/164, 269/209, 269/287, 269/321 S

[51] **Int. Cl.** **B23q 3/18,** B25b 5/14, B25b 7/10

[50] **Field of Search** 269/9–10, 121, 124–125, 141, 164, 208–209, 287, 309, 321–325

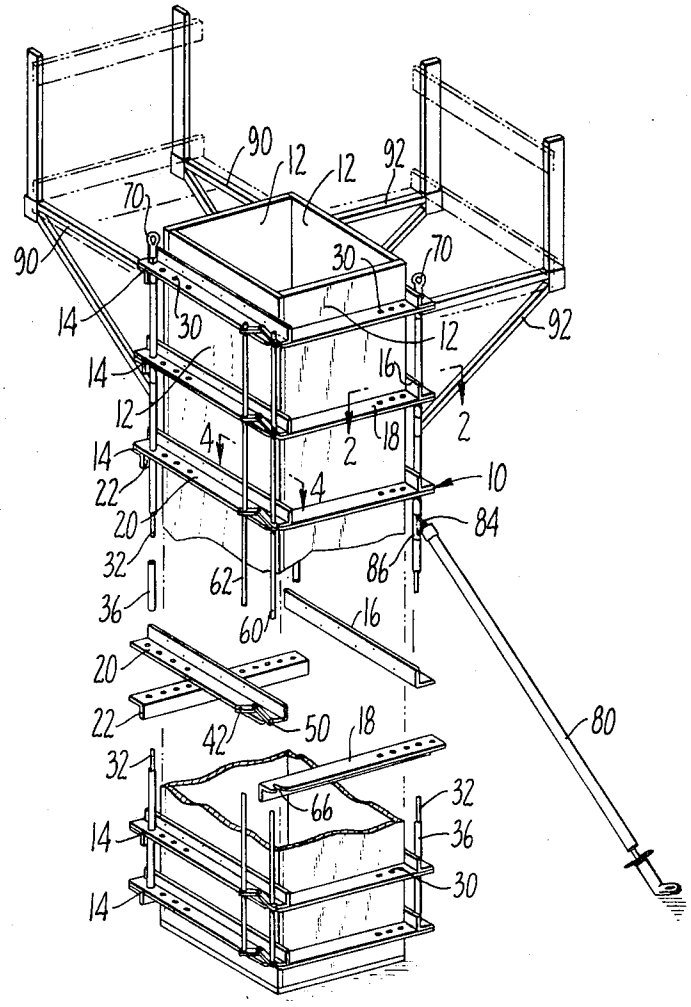
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ABSTRACT: A concrete column form clamp and method. The clamp includes a plurality of frame members adapted to have form panels secured thereto, each of said frame members comprising a plurality of frame sections, and a plurality of elongated rod members, each of said rod members having hingedly mounted thereon adjacent frame sections of each of said frame members and extending between all of said frame members whereby corresponding sections of said frame members are ganged for articulated movement and said form clamp may be handled as a unit. The form clamp includes spacer means for maintaining adjacent frame members in spaced relationship to one another. Locking means is provided whereby the frame members may be selectively locked into a substantially rigid polygonal configuration.



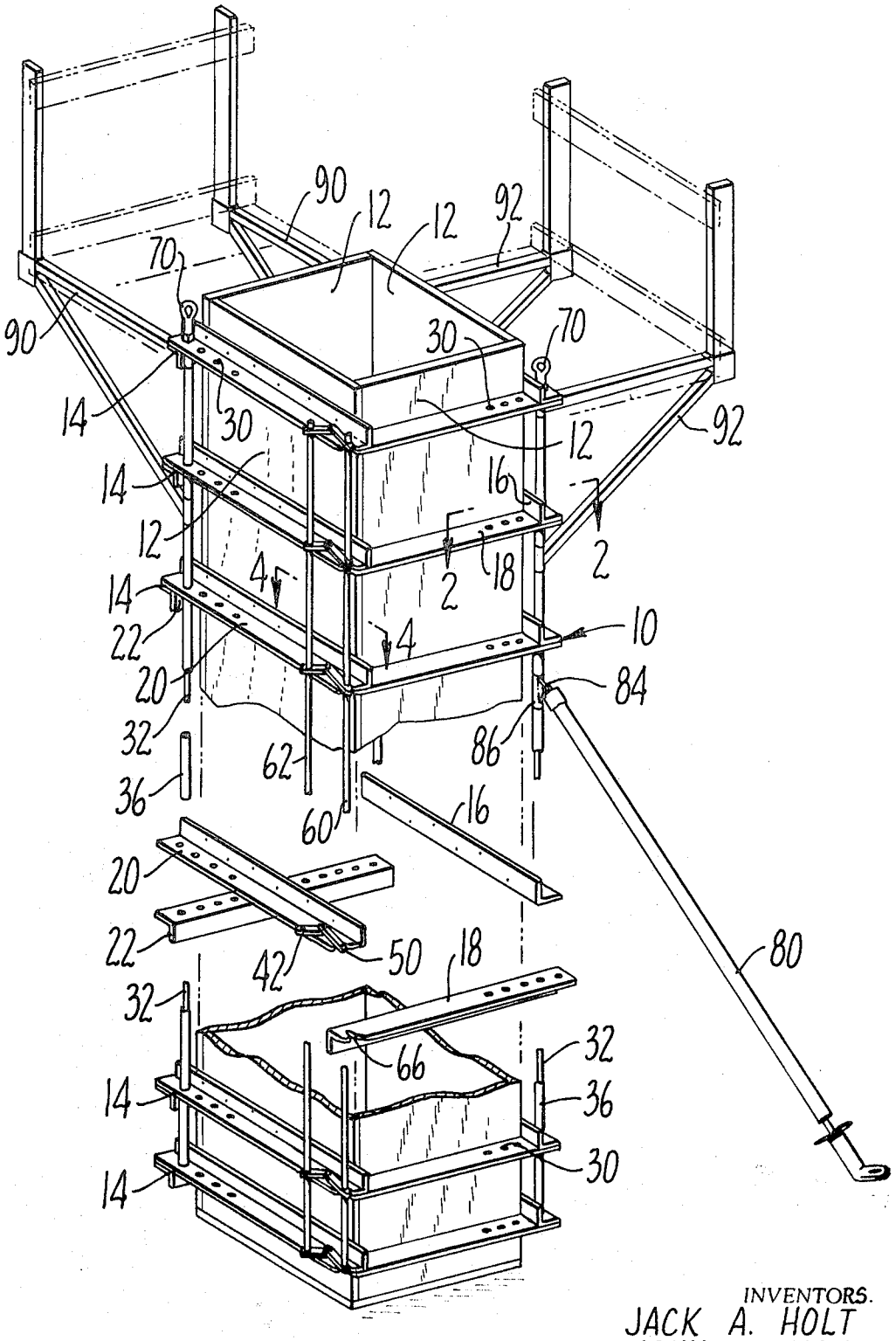


FIG. 1.

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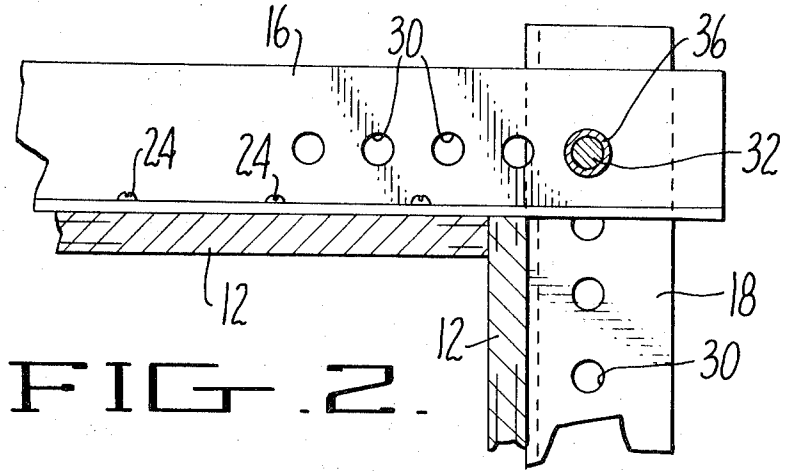


FIG. 2.

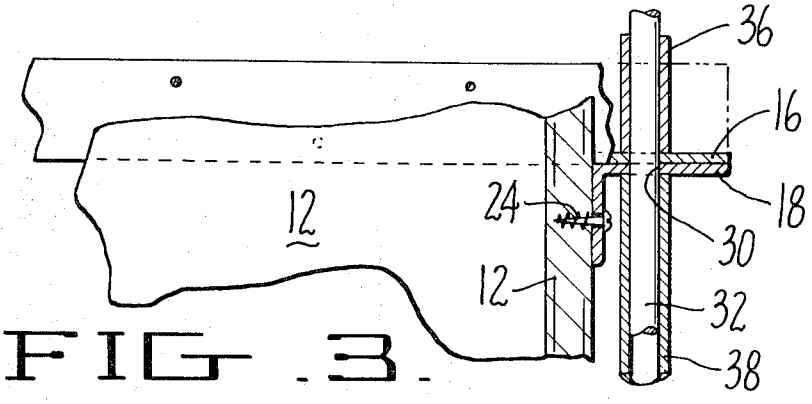


FIG. 3.

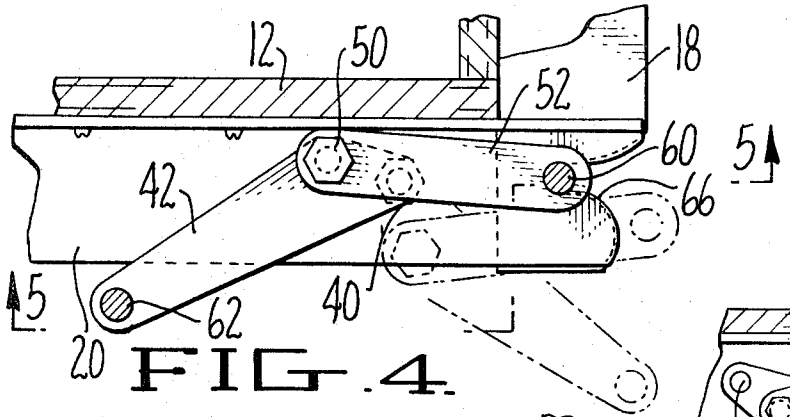


FIG. 4.

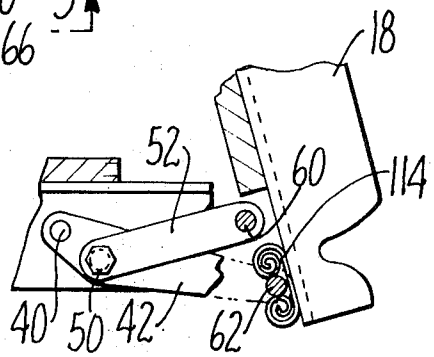


FIG. 6.

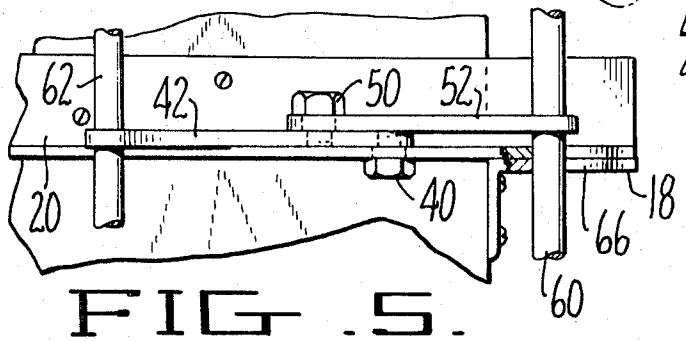


FIG. 5.

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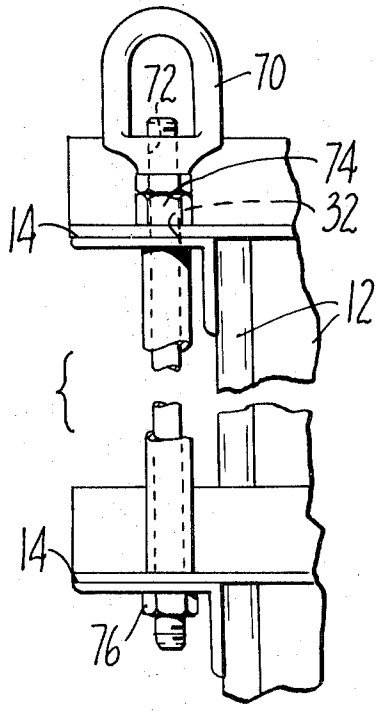


FIG. 7.

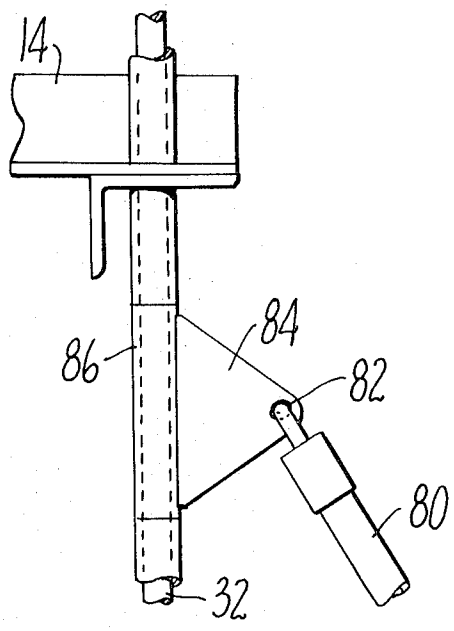


FIG. 8.

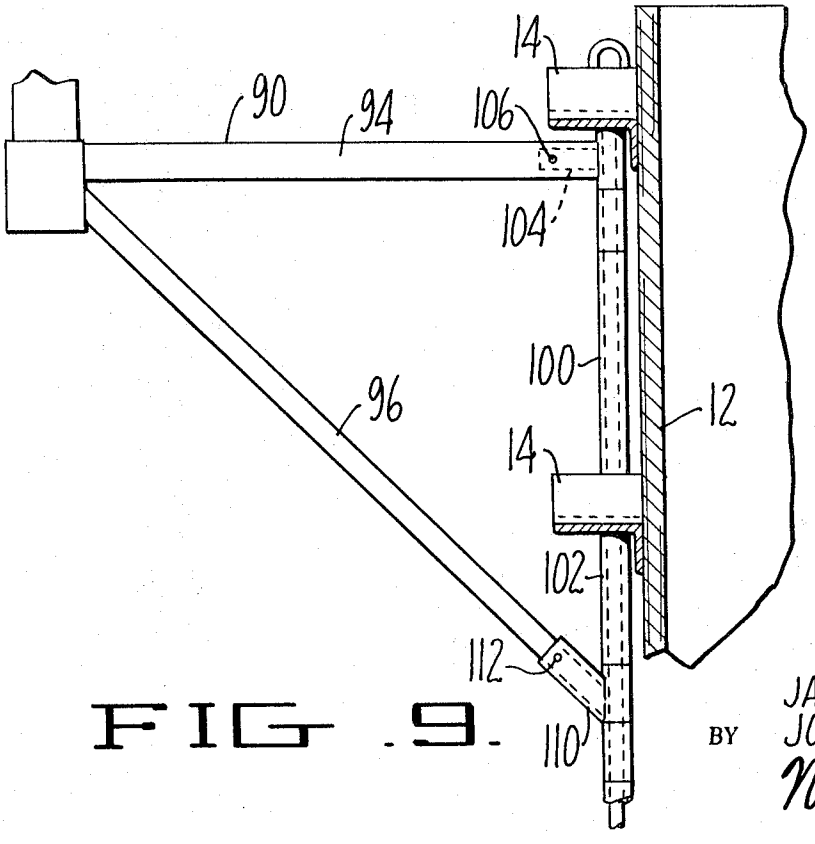


FIG. 9.

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CONCRETE COLUMN FORM CLAMP AND METHOD

BACKGROUND OF THE INVENTION

The present invention relates to the art of molding concrete, and more particularly, to a method and apparatus employed in the formation of molded concrete columns and the like.

In the construction of molded concrete columns, the customary prior art approach has been to construct at the work site a mold formed of plywood sheeting or similar material and pouring concrete thereinto. After the concrete has hardened sufficiently, the mold is removed from the formed concrete column or the like by stripping away the plywood sheeting. To maintain the mold in a stable configuration during the pouring and hardening of the concrete cooperating frame members disposed about the forms and lockingly engaged therewith have been utilized. The frames when in assembled condition in effect constitute rigid reinforcement means whereby the form sheets are maintained in the desired configuration. When the concrete column or the like is suitably cured, the frames and molds are disassembled therefrom and transported to another site whereupon they are again reassembled into the desired mold configuration

Certain difficulties and disadvantages are inherent in the use of the above-noted prior art approach. Many of the structural arrangements utilized in carrying out the above noted prior art approach. Many of the structural arrangements utilized in carrying out the above-noted prior art approach are characterized by their inability to be employed in other than a single mold configuration. Much of the equipment so employed is also characterized by its complexity and relatively high expense. A further disadvantage inherent in the known prior art mold arrangements resides in the fact that they must be disassembled and then reassembled when being transported from one mold site to another. The attendant handling and storing difficulties inherent in prior art equipment of this nature greatly adds to the overall expense of using same.

SUMMARY OF THE INVENTION

It is therefore an object of the present invention to provide an apparatus for molding concrete columns or the like which is characterized by its relative simplicity of construction and use.

It is a further object of the present invention to provide apparatus for molding concrete columns or the like which is readily adapted for employment in the formation of molded structures of varying sizes.

It is yet another object of the present invention to provide apparatus for forming molded concrete columns or the like which may readily be transported from one mold site to another as a unit thereby avoiding the necessity for disassembling and reassembling same.

It is yet another object of the present invention to provide apparatus for forming concrete columns or the like which is readily adapted for ease of assembly, storage and handling.

A still further object of the present invention is to provide an improved method of forming a concrete column or the like in a ready and efficient manner.

The above-noted and other objects of this invention have been attained as follows. A form clamp for concrete column mold has been provided which comprises a plurality of frame members adapted to have form panels secured thereto. Each of the frame members comprises a plurality of frame sections. A plurality of elongated rod members extend between the frame members with adjacent frame sections of each of the frame members hingedly mounted thereon. Spacer means is disposed on said rod members between adjacent frame members to maintain them in spaced relationship to one another. Bracket members are provided on the spacer means which are adapted to cooperate with scaffolding, support means and the like. A cam-type locking arrangement is provided whereby the form clamp may be selectively locked into a rigid, polygonal configuration. Means is provided to facilitate the movement of the assembled form clamp and forms affixed thereto from one mold site to another.

DESCRIPTION OF THE DRAWINGS

The above-noted and other objects of this invention will be understood from the following description taken with reference to the drawings wherein:

FIG. 1 is a perspective view illustrating the form clamp according to the present invention assembled at the mold site in combination with a plurality of mold from panels;

FIG. 2 is an enlarged cross-sectional view taken along the line 2—2 of FIG. 1 and illustrating details of two cooperating frame sections and associated structure;

FIG. 3 is an enlarged fragmentary side view in partial cross section illustrating details of the spacer means and associated structure employed in a form clamp constructed in accordance with the teachings of the present invention;

FIG. 4 is an enlarged cross-sectional view taken along the line 4—4 of FIG. 1;

FIG. 5 is an enlarged cross-sectional view taken along the line 5—5 of FIG. 4;

FIG. 6 is an enlarged fragmentary view illustrating selected details of structure associated with the form clamp locking means;

FIG. 7 is an enlarged fragmentary side view illustrating details of a selected elongated rod member and associated structure including means adapted to facilitate the ready movement of the form clamp of the present invention from one preselected location to another;

FIG. 8 is an enlarged fragmentary side view illustrating details of the form clamp spacer means and associated bracket; and

FIG. 9 is a fragmentary side view in partial cross section illustrating details of outrigger brackets employed on the form clamp constructed in accordance with the present invention in conjunction with scaffolding or the like.

DESCRIPTION OF THE ILLUSTRATED EMBODIMENT

Referring now to FIG. 1 of the drawing, a form clamp constructed in accordance with the teachings of the present invention is designated generally by means of reference numeral **10**. Form clamp **10** is illustrated in the position assumed thereby when it is in combination with a plurality of form panels to act as a mold for the fabrication of a concrete column. In the drawing the panels, which may be constructed of plywood or the like, are each designated by means of reference numeral **12**. Together the form clamp **10** and form panels **12** comprise a mold assembly into which concrete is poured and allowed to harden to form a column, which in this instance is one having a rectangular cross section.

In the illustrated embodiment form clamp **10** includes a plurality of frame members **14** which are of substantially identical construction. Each of the frame members comprises a plurality of individual frame sections **16**, **18**, **20** and **22** which are secured together in a manner which will be set forth in greater detail below to define the desired mold configuration. The frame member sections may be constructed as illustrated out of steel angle stock and having a length somewhat greater than the width of the form panels with which they are associated.

Holes are formed in both the horizontally disposed leg and the vertically disposed leg of the frame member sections. The holes in the vertically disposed frame member sections. The holes in the vertically disposed frame member section legs are adapted to receive therein suitable connectors such as screws **24** (FIG. 3) adapted to secure the frame member sections to their respective form panels **12**. Spaced throughbores **30** are formed at least partially along the length of frame member sections **16**, **18**, **20** and **22** in the horizontally disposed legs thereof.

Passing through vertically aligned throughbores **30** of the frame members **14** are elongated rod members **32**. Although only two such elongated rod members **32** may be seen in FIG. 1 it should be appreciated that three such members are actually employed when the from clamp constructed in accordance with the teachings of the present invention is adapted to assume a rectangular shape as shown in the illus-

trated embodiment. That is, elongated rod members 32 are positioned at three of the four corners of the rectangularly shaped mold assembly.

The operation of the elongated rod members 32 and form clamp structure operatively associated therewith may most readily be seen with reference to FIGS. 1, 2 and 3. The rod members 32 have a cross-sectional dimension somewhat less than the diameter of each of the spaced throughbores 30. At the corners of the mold assembly adjacent frame sections of each frame member overlap with a throughbore 30 of one frame section being disposed in alignment with a throughbore 30 of the overlapping adjacent frame section. At the previously described three corners of the mold assembly an elongated rod member 32 is passed through the aligned throughbores 30 of each of the overlapping sets of the frame sections of the frame members. In FIG. 2 the illustrated elongated rod member 32 passes through the aligned throughbores 30 of frame sections 16 and 18 which are disposed closest to the ends of those sections. It will be appreciated that when the other elongated rod members 32 associated with the form clamp 10 are in the same aligned endmost throughbores of the other overlapping frame sections, the mold assembly defines an interior of the greatest possible capacity within the limitations of the design of the particular frame members 14. By selecting different throughbores 30 through which elongated rod members 32 project the size and configuration of the column to be molded may be altered. Of carriers, the width of form panels 12 would have to be modified in the event of such a change. Because the cross-sectional dimension of elongated rod members 32 is less than the diameters of throughbores 30 adjacent and overlapping frame sections associated with each of the elongated rod members are in effect hingedly mounted with respect to the elongated rod member and to one another. In FIGS. 1, 2 and 3, however, the frame members are all clamped into a rigid configuration by locking means which will be described below. When the locking means is selectively disengaged in the manner which will also be brought out in greater detail below, it is desirable that adjacent and overlapping frame member sections of each frame member be relatively freely moveable with respect to one another about the three previously described elongated rod members 32. For this reason, the sections of each frame member are staggered so that the vertically disposed leg of one section is in an upward direction while the vertically disposed leg of the next section is disposed in a downwardly direction.

So that each frame member 14 of the mold assembly may be employed to its maximum advantage, it is of course desirable to space the frame members with respect to one another along the length of form panels 12. To accomplish this spacer means in the form of tubular members are disposed along the length of elongated rod members 32. In FIGS. 2 and 3 two such tubular members are designated by means of reference numerals 36 and 38 The tubular members have an inside diameter slightly larger than the outer diameter of the elongated rod members 32 and have an external diameter substantially greater than the diameter of throughbores 30. It will be appreciated that the tubular members abut at the ends thereof against adjacent frame members 14 thereby maintaining said frame members in a predetermined distance from one another. It will be readily understood that the distance between adjacent frame members 14 may readily be varied by changing the lengths of the tubular members lying therebetween.

Referring now to FIGS. 1, 4 and 5, the locking mechanism employed to selectively maintain the form clamp of the present invention in a rigid configuration will be described. Briefly, the locking means is the form of a toggle mechanism which is disposed at the corner of the mold assembly not occupied by one of the three elongated rod members, that is, the corner at which sections 18 and 20 of each frame member 14 are in overlapping adjacent relationship to one another. With particular reference to FIGS. 4 and 5, pivotally mounted upon the horizontally disposed leg of frame member section 20, as by means of a pivot bolt 40 passing therebetween, is a toggle arm 42 of irregular configuration. Spaced inwardly from and offset with respect to the point of interconnection between toggle arm 42 and pivot bolt 40 is a second pivot bolt 50 which is secured to the toggle arm 42 in any desired manner such as by being threadedly engaged therewith. Second pivot bolt 50 provides an interconnection between toggle arm 42 and a connector link 52. It will be appreciated that as the toggle arm 42 is pivoted in a counterclockwise direction (as viewed in FIG. 4) about pivot bolt 40—that is, from the illustrated solid line position to the illustrated dotted line position —the connector link 52 will move toward the right.

As may most clearly be seen with reference to FIGS. 1 and 5, a locking rod 60 interconnects all of the connector links 52 of the form clamp at the ends thereof which are disposed away from their respective points of pivotal interconnection with the associated toggle arms 42. In like manner, a common actuator rod 62 extends the full length of the form clamp 10 interconnecting all of the toggle arms 42 thereof for ganged movement about their respective pivot bolts 40.

All of the frame member sections 18 of the form clamp 10 have a slot formed therein as at 66 (FIG. 4) which is adapted to accommodate therein locking rod 60.

The operation of the form clamp constructed in accordance with the teachings of the present invention will now be described. As soon as the contractor has arrived at a determination as to the size of the concrete column he wishes to construct, the mold assembly is fabricated in accordance with the predetermined requirements. This may be done quite readily through the use of a form clamp constructed in accordance with the present invention since it readily lends itself to fabrication in a wide variety of configurations and sizes even though the same hardware is utilized. In other words, the form clamp may be constructed to accommodate varying degree of column height and cross-sectional configuration.

The first step in the fabrication of the form clamp 10 is to position the desired number of frame members 14 over the elongated rod members 32. In the illustrated embodiment this is done by placing the elongated rod members through the desired throughbores 30 of the frame member sections 16, 18, 20 and 22. As previously described, the configuration and size of the finished mold may be varied by selecting different throughbores 30 through which elongated rod members 32 project. To provide for the desired spacing between the frame members 14, tubular members having a length corresponding to the preselected spacing are threaded onto the elongated members alternatively with the frame members 14.

After the desired number of frame members 14 have been positioned on the elongated rod members 32 lock nuts are threaded on the ends of the elongated rod members 32 until they engage both the topmost and bottommost frame members 14.

The next step is to secure the desired form panels to the form clamp. This activity is readily facilitated by virtue of the present form clamp construction since the frame member sections thereof may be readily pivoted about their associated elongated rod members 32 so that they all lie in a substantially flat plane. If desired, the flattened form clamp may be positioned flat on the ground or other support surface to facilitate installation of the form panels. As previously indicated, this is done merely by attaching the form panels to the various frame member sections as by means of wood screws or the like. After the form panels 12 have been installed thereby completing formation of the entire mold assembly, the mold assembly may be transported to the desired work site whereupon the molding operation may begin. To facilitate the transport of the mold assembly, it is desirable that the locking mechanism thereof be actuated to lock the entire assembly into a rigid configuration, which in the case of the illustrated preferred embodiment is the rectangular configuration illustrated in FIG. 1. The locking operation is accomplished by manipulating the mold assembly from the flat position employed when attaching the form panels to the general configuration the

mold assembly will have when being utilized as the mold form. This will be done with the actuator rod **62** thereof moved toward the right as viewed in FIGS. **4** and **5**. This will enable the locking rod **60** to clear the ends of frame member section **18**. Actuator rod **62** will then be moved toward the left thereby causing toggle arm **42** to move in a clockwise direction and locking rod **60** to enter the slots **66** of frame member sections **18** thereby locking the entire mold assembly into a rigid configuration corresponding to the configuration of the column or other structural member to be molded.

To facilitate handling, at least one of the elongated rod members **32** has disposed at one end thereof a lift eye such as that shown in FIG. **7** and designated by means of reference numeral **70**. Ideally, two such eyes are provided and disposed, respectively, to assume positions at opposite corners of the closed from. In the illustrated preferred embodiment, elongated rod member **32** with which lift eye **70** is associated is threaded over a portion of its length. The lift eye **70** has a threaded throughbore **72** formed in the base thereof adapted to be threadedly engaged with the elongated rod member **32**. If desired, a lock nut **74** may be used to secure the lift eye **70** and the elongated rod member **32** against relative movement. The other end of the elongated rod member **32** may, as shown, also be threaded and have a nut **76** positioned thereon. A crane hook (not shown) or the like may be inserted into one or more lift eyes **70** to transport the mold assembly to the desired location in an obvious manner.

It is normally desirable to provide a certain degree of stabilization support to the mold assembly at the work site so that it will remain steadily in position during the concrete pouring and curing stages. In FIGS. **1** and **8** such stabilization is provided by means of a jack device secured between the mold assembly and a suitable stable surface. Jack device **80** may be of any suitable commercially available type. As may best be seen with reference to FIG. **8**, the uppermost extent of jack device **80** is connected to the mold assembly form clamp **10** by being secured as by means of a connector pin **82** to a bracket **84** which projects outwardly from one of the tubular spacer members **86** employed on the form clamp at a point lying substantially midway along the length Therefore. Preferably, tubular spacer member **86** is broken into individual segments between its two associated frame members **14** to facilitate relatively free rotational movement of bracket **84** about its associated elongated rod member **32**. It is to be understood that the jack device **80** may be attached to bracket **84** at some point prior to permanent installation of the mold assembly at the work site. The lower most end of the jack device is attached to a stable support surface and the jack devices actuated to assist in aligning the mold assembly in a vertical or other desired direction Obviously, more than one jacking device **80** may be employed for this purpose.

With reference to FIGS. **1** and **9** it may be seen that the mold assembly may be utilized to support additional structure such as outrigger brackets **90** and **92**. The outrigger brackets in turn, may be utilized to support scaffolding or the like which may be used during the concrete pouring of curing operations as a work platform. Attachment of the outrigger brackets **90** and **92** to the form clamp **10** is preferably accomplished by securing the outwardly projecting base portions of the outrigger brackets to selected segments of the form clamp tubular spacer members at a predetermined desired location along the length of the form clamp. One manner in which this may be accomplished may be seen with particular reference to FIG. **9** wherein base portions **94** and **96** of the outrigger bracket are illustrated as being secured to segments of two tubular spacer members **100** and **102**, respectively. Two different arrangements for accomplishing this are illustrate both of which, however, employ a male-female coupling arrangement for accomplishing the desired interconnection. Base portion **94** is preferably of hollow construction and may have any desired cross-sectional configuration, such as circular, rectangular, etc. Projecting outwardly from the uppermost extent of tubular spacer member **100** is an element **104** adapted to enter into the interior of base portion **94** and be secured therein as by means of a connector pin **106**. Interconnection between base portion **96** and its associated tubular spacer member **102** is had by means of a socket **110** projecting outwardly from the tubular spacer member which is adapted to receive the end of the base portion **96**. Again, a connector pin **112** may be utilized to secure the base portion **96** in position. As with respect to the previously described bracket **84**, it is preferred that the tubular spacer members **100** and **102** with which base portions **94** and **96** are associated be segmented so that the outrigger brackets **90** and **92** may rotate freely with respect to the remainder of the form clamp **10** when they are not locked into outwardly extending position as by means of scaffolding or the like. This facilitates both the previously described attachment of the form panels **12** to the form clamp and removal of the clamp from a formed column by allowing the clamp to assume in an unimpeded fashion a substantially flat configuration.

After the mold assembly has been placed into position as previously described, the concrete pouring operation takes place. After the concrete column or the like has been molded and cured, the entire mold assembly may be readily transported as a complete unit from the site of that column to an additional work site where another column or the like may be formed through the use thereof. This may be done quite simply, with a minimum of effort and time involved. After the concrete column or the like has cured to the satisfaction of the contractor, actuator rod **62** is moved to the right as viewed in FIGS. **4** and **5**, thus unclamping the mold assembly from the formed column. After disconnecting the lower end of jack device **80** from its support surface, the assembly can be lifted as an integral unit by its lift eyes **70** up and over the formed column and then transported to the new work site. Actuator rod **62** is again then actuated to lock the form panels **12** into engagement to provide the desired mold configuration. Jack device **80** is then again attached to a suitable surface at the lower end thereof and manipulated to adjust the positioning of the mold assembly.

An arrangement for providing a certain degree of stability to the entire assembly as it is being transported from one location to another is illustrated in FIG. **6**. At the notched end thereof frame member section **18** has attached thereto a generally C-shaped spring clip **114** which is adapted to releasably retain therein actuator rod **62** of the form clamp **10** when the mold assembly is being transported. It will be appreciated that a number of such C-shaped spring clips may be employed, as for example, by incorporating one such clip with each form clamp frame member section **18**. With the actuator rod **62** positioned within the spring clips **114** as shown, the form panels **12** are sufficiently disengaged from the molded column to allow movement between the mold assembly and the column. The retention of the actuator rod within the spring clips, however, prevents the mold assembly from flapping about as it is being transported. After the mold assembly has been moved to the new work site, actuator rod **62** is disengaged from the associated spring clips **114** and the rod **60** is again positioned within slots **66** of frame member sections **18**. Actuator rod **62** is manipulated to lock the entire mold assembly into the desired configuration.

While this invention has been described with reference to a preferred embodiment thereof, it will be understood that various modifications and variations may be effected by those skilled in the art within the spirit and scope of the invention and as defined in the subjoined claims.

I claim as my invention:

1. A form clamp for concrete column molds comprising, in combination:

a plurality of frame members adapted to have form panels secured thereto, each of said frame members comprising a plurality of frame sections; and

a plurality of elongated rod members, each of said rod members having hingedly mounted thereon adjacent frame sections of each of said frame members and extending

between all of said frame members whereby corresponding sections of said plurality of frame members are ganged for articulated movement about said elongated rod members and said form clamp may be handled as a unit.

2. The form clamp according to claim 1 additionally comprising spacer means disposed on at least one of said rod members between adjacent frame members to maintain said frame members in spaced relationship to one another.

3. The form clamp according to claim 2 wherein said spacer means comprises a plurality of tubular members slidably disposed about at least one of said rods, at least one of said tubular members being in endwise abutting engagement with said frame members to maintain said spaced relationship.

4. The form clamp according to claim 3 additionally comprising bracket means connected to at least one of said tubular members.

5. The form clamp according to claim 3 additionally comprising outrigger support means attached to at least one of said tubular members.

6. The form clamp according to claim 1 additionally comprising means for selectively locking said frame members into a substantially rigid polygonal configuration.

7. The form clamp according to claim 6 wherein said frame members each comprise at three corners of said rectangular configuration, said locking means being disposed at the sections, the sections of each frame member adapted to be locked into a rectangular configuration by said locking means, said sections each having formed therein fourth plurality of spaced throughbores through which said elongated rod members are adapted to selectively project thereby varying the size of the rectangular configuration.

8. The form clamp according to claim 7 wherein said elongated rod members are disposed at three corners of said rectangular configuration, said locking means being disposed at the fourth corner whereby the sections of each frame member may be pivoted about said elongated rod members upon unlocking of said locking means at said fourth corner to lie along a substantially flat plane thereby facilitating attachment or detachment of said form panels.

9. The form clamp according to claim 6 wherein at least some of said sections of each frame member have a plurality of spaced throughbores formed therein through which said elongated rod members are adapted to selectively project whereby the rectilinear configuration of said frame members may be varied.

10. The form clamp according to claim 9 additionally comprising spacer means disposed on at least one of said rod members between adjacent frame members to maintain said frame members in spaced relationship to one another.

11. The form clamp according to claim 10 wherein said spacer means comprises tubular members disposed about at least one of said elongated rod members between said frame members, said tubular members having an external diameter greater than the diameter of each of said spaced throughbores whereby said tubular means is in endwise abutment with said frame members adjacent to said throughbores.

12. The form clamp according to claim 6 additionally comprising secondary locking means for releasably locking said frame members in a second substantially rigid polygonal configuration to facilitate the transport thereof from one location to another.