United States Patent

Thomas

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[45] **July 18, 1972**

[54] PRE-FAB FORM FOR CONCRETE

[72] Inventor: **Robert E. Thomas,** 9581 Vons Drive, Garden Grove, Calif. 92641

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[51] **Int. Cl.**.....**E04q 13/02**

[58] **Field of Search**.....249/48, 118, 137, 160, 168–171; 25/118 RR; 292/100, DIG. 49; 269/115

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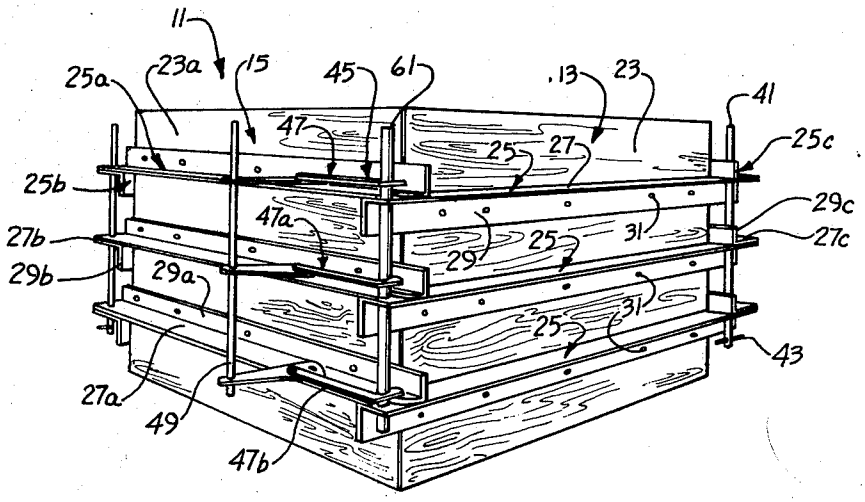
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Primary Examiner—J. Spencer Overholser
Assistant Examiner—Dewalden W. Jones
Attorney—Smyth, Roston & Pavitt

[57] **ABSTRACT**

A pre-fab form for concrete comprising a plurality of walls pivotally interconnected and capable of being arranged to substantially circumscribe a region into which concrete can be poured. A lock mechanism releasably interconnects one pair of walls to permit selectively opening and closing of the form.

15 Claims, 6 Drawing Figures



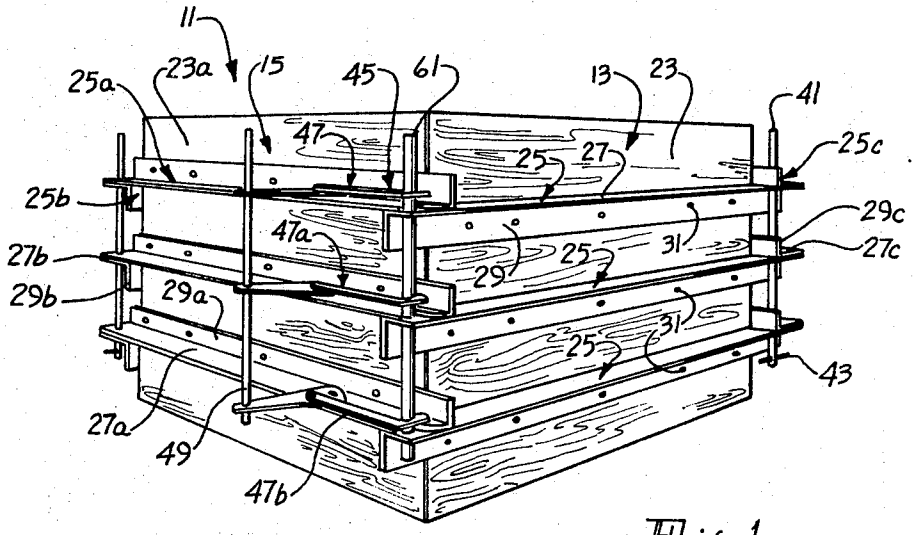


Fig. 1

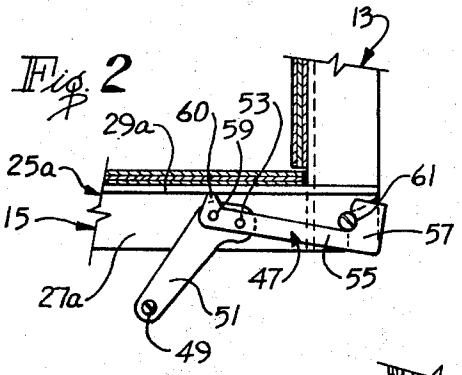


Fig. 2

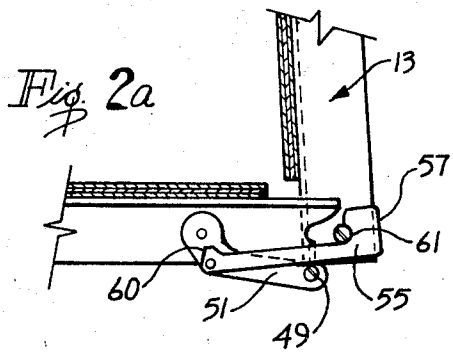


Fig. 2a

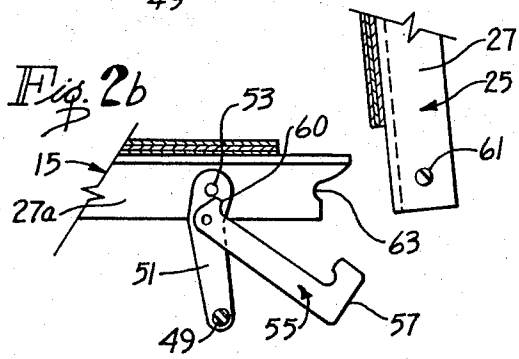


Fig. 2b

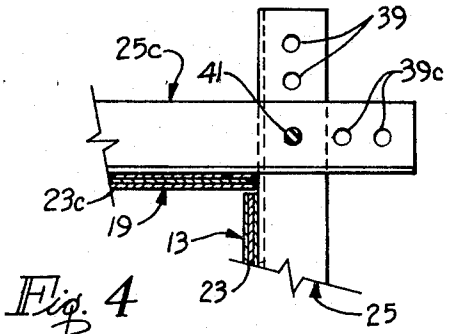


Fig. 4

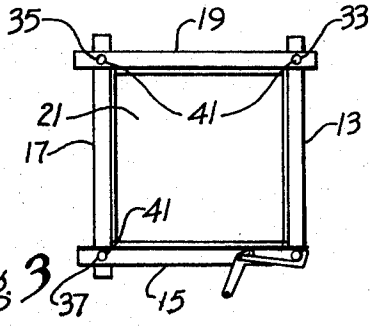


Fig. 3

INVENTOR:
Robert E. Thomas

By: Smyth Roston & Pavitt
ATTORNEYS

PRE-FAB FORM FOR CONCRETE

BACKGROUND OF THE INVENTION

In constructing objects from concrete, it is necessary to provide an appropriate form into which the liquid concrete can be poured and allowed to cure. Typically, a form for concrete is constructed at the work site in the particular configuration desired. This requires substantial time for a skilled workman. When the concrete has cured sufficiently, the form is removed. Removal of the form also requires substantial time and may involve damage or loss of some of the material of the form so that it cannot be reused.

In an effort to obviate these substantial disadvantages, it has been proposed to use pre-fab forms. These forms are erected in a shop or at the work site from several pre-fabricated parts, and accordingly, the time required for setup is decreased to the extent that the number of parts which must be assembled is reduced. The time required for tear down is similarly reduced. Unfortunately, however, many pre-fab forms still require substantial time to erect and tear down. Another problem with pre-fab forms is that they are bulky and oftentimes are difficult to ship.

SUMMARY OF THE INVENTION

The present invention provides a pre-fab form for concrete which is particularly adapted for use in the pouring of concrete columns. The concrete form of this invention can be easily set up and taken down and can be easily reduced to a very small volume to facilitate shipment thereof. According to the present invention, these advantages are obtained, in part, by providing a concrete form which includes a plurality of walls with the adjacent walls being pivotally interconnected. The pivotal connections are such as to permit the form to be fully collapsed and there are no parts to assemble at the worksite.

The form is closed by a locking mechanism mounted on one pair of adjacent walls. To set up the form, it is only necessary to position the several walls of the form as desired, and then operate the locking mechanism to lock the form in a closed position. Thereafter, the concrete can be poured into the form, and when the concrete has cured, the locking mechanism is released to permit separation of the form from the resulting solidified concrete column as a single unit. The form may then be moved to a new position and reused thereby saving labor and materials.

As the form may be relatively long, it is often desirable to provide several locks along the length of the form to assure that the form will be rigidly locked in the closed position. One advantage of the present invention is that all of these locks can be simultaneously operated by a single operating member thereby further decreasing the time required to set up and take down the form.

One danger inherent in pouring of large columns of concrete is that the form may be inadvertently opened before the concrete sets. For example, if the locking mechanism is released by error before the concrete sets, the force of the flowable concrete acting outwardly will rapidly pivot the walls carrying the locking mechanism outwardly thereby freeing tons of concrete which may cause substantial damage or injury.

The locking mechanism of this invention embodies a safety feature which positively prevents such an occurrence. With the present invention, the locking mechanism includes at least one latch mounted on one wall section for movement relative thereto and a cooperating member mounted on an adjacent wall. An operating member is movable between a locking position and a releasing position to thereby lockingly engage and dis-engage, respectively, the latch and the cooperating member. In moving from the locking position to the releasing position, the latch is movable along the same path that the cooperating member would move if it were allowed to move due to the internal force of the flowable concrete within the form. Thus, if the operating member is inadvertently moved to the releasing position, the latching member and the cooperating member move together and do not disengage.

The form must be very strong and to this end, each of the walls thereof can advantageously be constructed of a panel and reinforcing members. The panel is preferably constructed of wood, such as plywood, and the reinforcing members are preferably removably mounted on the panels to permit replacement of a damaged or worn panel.

The present invention provides a strong, simple and inexpensive hinge for pivotally connecting adjacent walls. This can be accomplished by providing reinforcing members of sufficient length to project beyond the edges of the panel on which they are mounted. Each of the reinforcing members has an aperture adjacent the edge of the panel on which it is mounted, and a rod fits loosely through these apertures to thereby pivotally connect the adjacent walls. Preferably the reinforcing members of one wall underlie and engage the reinforcing members of the adjacent wall to thereby provide the form with some rigidity in the direction axially of the form. Each of the reinforcing members can advantageously have several of these apertures therein to thereby adapt such member for use on panels of different widths.

Another advantage of the present invention is that several reinforcing members may be hinged together by a pin or similar device and then arranged in a loop. One of the locks of this invention can be used to releasably interconnect the free ends of the loop to thereby form a releasable, structural belt which can withstand substantial hoop stress. The belt has many uses such as in retaining the walls of a form for concrete.

The invention, both as to its organization and method of operating together with further features and advantages thereof, may best be understood with reference to the following description taken in connection with the accompanying illustrative drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of a pre-fab form for concrete constructed in accordance with the teachings of this invention.

FIG. 2 is a fragmentary plan view of one of the locks and the associated wall structure with the lock being in the locking position.

FIG. 2*a* is a plan view similar to FIG. 2 with the operating member having been moved to the releasing position prior to the time that the concrete within the form has hardened sufficiently to retain the shape of the form.

FIG. 2*b* is a top plan view similar to FIG. 2 with the lock having been released to open the form.

FIG. 3 is a top plan view of the form.

FIG. 4 is a top plan view of the corner construction of the form showing the pivotal connection between two of the adjacent walls.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to the drawings and in particular to FIG. 1 thereof, reference numeral 11 designates a pre-fab form for use in retaining flowable hardenable substances in a pre-determined configuration while such substance hardens. Although the form 11 is particularly adapted for use with concrete, it should be understood that its use is not limited to concrete and that other materials may be cast therein.

In the embodiment illustrated, the form 11 is generally square in plan as shown in FIG. 3; however, it should be understood that the shape of the form in plan can be changed depending upon the desired configuration of the object which is to be formed. Similarly, the height of the form 11 can be increased or decreased depending upon the height of the object which is to be formed.

The form 11 includes four walls 13, 15, 17 and 19 with each of such walls serving to retain one side of the concrete object which is to be formed. Each of the walls 13, 15, 17 and 19 are rectangular and are of substantially the same size. As shown in

FIGS. 1 and 3, the walls 13, 15, 17 and 19 are arranged to surround a region 21 into which concrete can be poured. Each of the walls has axial or vertical edges, and the walls are arranged with the axial edges thereof being adjacent. Except as specifically noted herein, the walls 13, 15, 17 and 19 are identical.

The wall 13 which may be taken as typical includes a broad rectangular panel 23, preferably constructed of plywood, and a plurality (three being illustrated) of transversely extending, vertically spaced, parallel reinforcing members 25. The reinforcing members 25 are preferably constructed of metal such as steel and each of them includes a horizontal leg 27 and a vertical leg 29. The vertical legs 29 project downwardly from the horizontal legs 27. The reinforcing members 25 are releasably mounted on the panel 23 by a plurality of screws 31. The end portions of the reinforcing members 25 preferably project horizontally beyond the vertical edges of the panel 23.

The walls 15, 17 and 19 are substantially identical to the wall 13 and corresponding parts are designated by corresponding reference numerals followed by the numeral a, b and c, respectively. The reinforcing members 25*a* are identical to the reinforcing members 25 except that the vertical leg 29*a* projects upwardly from the horizontal leg 27*a*. The wall 17 which is opposite the wall 13 has its reinforcing members 25*b* arranged with the vertical leg 29*b* projecting downwardly from the horizontal leg 27*b* and thus is similar to the wall 13. The wall 19 which is opposite the wall 15 has its reinforcing members 25*c* arranged with the vertical leg 29*c* projecting upwardly from the horizontal leg 27*c* and thus is similar to the wall 15.

This arrangement of the reinforcing members permits the end portions of the reinforcing members to cooperatively overlap. For example, the horizontal leg 27*a* of the reinforcing member 25*a* overlies and is contiguous the horizontal leg 27*b* of the wall 17.

The form 11 has corners 33, 35 and 37 (FIG. 3) with the walls forming such corners being pivotally interconnected. FIG. 4 shows a typical pivotal connection between the walls 13 and 19. As shown in FIG. 1, the reinforcing members 25*c* and 25 are arranged in pairs with each of such pairs having the end portion of the reinforcing member 25*c* overlap the end portion of the associated reinforcing member 25. The end portions of the reinforcing members 25 and 25*c* are formed with apertures 39 and 39*c*, respectively, arranged in spaced relationship lengthwise of their respective reinforcing member. A pair of the apertures 39 and 39*c* are in registry to permit the insertion of a pivot rod 41 therethrough. As shown in FIG. 1, the rod 41 extends vertically through the registering apertures of each of the pairs of reinforcing members 25 and 25*c*. The lowermost reinforcing member 25 has a tab 43 projecting outwardly therefrom to support the rod 41 from dropping vertically from its position shown in FIG. 1. The corners 35 and 37 are constructed identically to the corners 33 to permit relative pivotal movement between the walls forming such corners.

FIGS. 1–2*b* show locking means 45 for releasably interconnecting the adjacent axial edges of the walls 13 and 15. The locking means 45 includes a plurality of identical toggle locks 47, 47*a* and 47*b* operable simultaneously by a common operating member 49. In the embodiment illustrated one toggle lock is provided for each pair of reinforcing members 25 and 25*a*, although other numbers of the toggle locks can be used.

Each of the toggle locks 47 is identical and accordingly only the toggle lock 47 is described in detail. The toggle lock 47 includes a link 51 pivotally connected by a pin or shaft 53 to the horizontal leg 27*a* of the associated reinforcing member 25*a*. The outer end of the link 51 is connected to the operating member 49 so that the latter can pivot the link 51. A latch 55 having a hook 57 at one end thereof is pivotally connected the other end thereof by a pin or shaft 59 to the link 51. The latch 55 has a stop 60 adjacent the shaft 59. The pin 59 is spaced radially from the pin 53 so that in the locking position shown in FIG. 2, 4c the lock 47 is over center. The hook 57 cooperates with a cooperating or locking member in the form of an elongated rod 61 which projects through the horizontal legs 27 of the reinforcing members 25 and is suitably affixed thereto. The outer end of the horizontal leg 27*a* contains a slot or groove or recess 63 shaped to receive a circumferentially extending portion of the rod 61.

In the locking position shown in FIG. 2, the rod 61 is received in the slot 63 and is retained therein by the hook 57. The rod 61 is attached to and engages the wall 13 to prevent separation of the walls 13 and 15. The force of the flowable concrete within the region 21 will normally urge the wall 15 outwardly (downwardly as viewed in FIG. 2) about its pivot rod 41 and the wall 13 outwardly (to the right as viewed in FIG. 2) about its pivot rod 41. The wall 15 cannot move or pivot in this direction because of the engagement between the slot 63 and the rod 61. It is important to note that formation of the slot 63 by cutting away material from the member 25*a* does not significantly reduce its section modulus. Furthermore, the wall 13 cannot move or pivot to the right about its pivot rod 41 because the hook 57 prevents this motion. Furthermore, any force tending to pivot the wall 13 in this direction tends to move the toggle lock 47 further over center, i.e., tends to pivot the link 51 clockwise as viewed in FIG. 2. The vertical leg 29*a* of the reinforcing member 25 engages the stop 60 to limit the amount of overcenter movement of the toggle lock 47. Each of the toggle locks 47, 47*a* and 47*b* functions as described above to lock the form in the closed position.

To move the locking means 45 from the locking position (FIG. 2) to the releasing position (FIG. 2*b*), the operating member 49 is moved to simultaneously pivot the links 51 counterclockwise about the respective pins 53 to the position shown in FIG. 2*b*. This permits the wall 15 to be pivoted outwardly to completely open the form. With the form 11 removed, it can be laid out flat for shipment or storage.

FIG. 2*a* illustrates a safety feature of the present invention. Until the concrete within the form 11 hardens sufficiently to retain the shape of the interior of the form, it exerts a radial outward force on the walls which tends to move the wall 13 to the right as viewed in FIG. 2*a*. If the operating member 49 were inadvertently utilized to pivot the links 51 counterclockwise until the locks 47, 47*a* and 47*b* were not over center, the radial outward force of the flowable concrete would immediately pivot the wall 13 about the rod 41 to the right as viewed in FIG. 2*a*. The rod 61 would move with the wall 13 and withdraw the latch 55 to the right and causing further counterclockwise pivotal movement of the links 51. However, interlocking engagement between the hook 57 and the rod 61 would be maintained throughout the full movement of the latch 55. Ultimately, movement of the latch 55 would be arrested when the links 51 are pivoted to their maximum position or when the operating member 49 abuts the leg 27*a*. In this manner, rapid complete collapse of the form 11 would be prevented or at least delayed by the interengagement of the hook 57 and the rod 61 to allow nearby workmen to get out of the way.

The reinforcing members are arranged in axially spaced circumferentially extending rows or belts. For example the uppermost members 25, 25*a*, 25*b* and 25*c*, their hinge connections and the lock 47 form one belt. It should be appreciated that these belts can be used for other purposes.

Although an exemplary embodiment of the invention has been shown and described, many changes, modifications and substitutions may be made by one having ordinary skill in the art without necessarily departing from the spirit and scope of this invention.

I claim:

1. A prefab form for concrete comprising:

a plurality of walls including first and second walls, at least one of said walls being reinforced, said first and second walls having locking edges;

means for pivotally interconnecting said walls while leaving said locking edges disconnected whereby said walls can

be arranged to substantially circumscribe a region into which concrete can be poured, said first and second walls being pivotable to move said locking edges toward and away from each other;

means on said first wall defining a groove opening generally laterally of said form;

a locking member;

means for mounting said locking member on said second wall;

means for moving said locking member generally laterally into said groove to define a locking position in which said first and second walls are interconnected generally along said locking edges and for moving said locking member generally laterally out of said groove to define a releasing position; and

the movement of said locking member generally laterally into said groove drawing said locking edges generally toward each other.

2. A prefab form as defined in claim 1 wherein said groove is a first groove, means on said first wall defining a second groove opening in the same general lateral direction as said first groove, said locking member including an elongated member, and said moving means moving said elongated member into said first and second grooves to define said locking position.

3. A prefab form as defined in claim 1 wherein said moving means includes a link connected to one of said walls and means for drivingly connecting said locking member and said link whereby pivotal movement of said link draws said locking member into said groove.

4. A prefab form as defined in claim 1 wherein said locking member includes an elongated member, said moving means includes a plurality of links pivotally connected to said one wall, a plurality of means drivingly connectible to said plurality of links, respectively, and to said elongated member, and a common operating member for pivoting said links together.

5. A prefab form as defined in claim 4 wherein said means defining a groove defines a plurality of grooves on said first wall opening in the same general lateral direction, said elongated member being received in said plurality of grooves in said locking position, said means for pivotally interconnecting permanently interconnecting said walls.

6. A form as defined in in claim 1 wherein said means for moving includes an operating member movable between the locking and releasing positions to thereby move the locking member between the locking and releasing positions, the pressure of flowable concrete in said region tends to move at least one of said walls outwardly along a predetermined path and said means for moving includes means responsive to movement of the operating member to the releasing position and the immediate movement of said one wall outwardly along said predetermined path for preventing the disengagement of said locking member and said groove whereby said form remains closed if the operating member is moved to the releasing position before the concrete in said region cures sufficiently to retain the shape of the form.

7. A prefab form for concrete comprising:

a plurality of walls including first and second walls, at least one of said walls being reinforced, said first and second walls having locking edges;

means for pivotally interconnecting said walls while leaving said locking edges disconnected whereby said walls can be arranged to substantially circumscribe a region into which concrete can be poured, said first and second walls being pivotable to move said locking edges toward and away from each other;

means on said first wall defining a recess;

a locking member;

overcenter toggle means including a link pivotally mounted on said first wall and connecting means pivotally mounted on said link or drivingly connecting the locking member and the link; and

said link being pivotable to a locking position in which said toggle means retains at least a portion of said locking member in said recess, said second wall being engageable with said locking member in said locking position whereby said first and second walls are connected adjacent said locking edges, said link being pivotable to a releasing position in which said walls are allowed to separate along said locking edges.

8. A firm as defined in claim 7 wherein said first wall includes a panel and a reinforcing member mounted on said panel, said recess being formed in an end portion of said reinforcing member.

9. A form as defined in claim 7 wherein said locking member is carried by said second wall.

10. A prefab form for concrete comprising:

a plurality of walls including first and second walls, said walls being arranged to substantially circumscribe a region into which the concrete can be poured;

said first wall having a locking edge and said second wall having a locking edge, said locking edges being adjacent when said wall substantially circumscribes said region;

means for permanently connecting said walls for relative pivotal movement without connecting said locking edges whereby said walls can be arranged to circumscribe said region and can be collapsed;

at least one wall including reinforcing means for reinforcing said one wall;

a plurality of overcenter toggle locks mounted on said first wall for movement relative thereto;

cooperating means on said second wall cooperable with said toggle locks to releasably connect said first and second walls generally along said locking edges;

each of said toggle locks being movable between a locking position in which the toggle locks engage the cooperating means to releasably connect the first and second walls generally along the locking edges and a releasing position in which said locking edges are disconnected; and

a common operating member for moving said toggle locks between said positions thereof.

11. A form as defined in claim 10 wherein said first wall includes means defining a groove and said cooperating means includes a cooperating member, said toggle locks retaining at least a portion of said cooperating member in said groove in said locking position whereby said toggle locks, said cooperating member and said groove cooperate to interconnect said first and second walls generally along the locking edges.

12. A form as defined in claim 11 wherein one of said toggle locks includes a latch, a link pivotally mounted on said first wall, means for pivotally mounting said latch on said link, said operating member being connected to said link to pivot said link, said cooperating member including an elongated rod, said latch retaining said cooperating member in said groove in said locking position.

13. A form as defined in claim 11 wherein said toggle locks include means for drawing the cooperating member into said groove with mechanical advantage.

14. A prefab form for concrete comprising:

a plurality of walls including first and second walls, said first and second walls having locking edges;

means for pivotally interconnecting said walls while leaving said locking edges disconnected whereby said walls can be arranged to substantially circumscribe a region into which concrete can be poured, said first and second walls being pivotable to move said locking edges toward and away from each other;

means on said first wall defining a groove opening generally laterally of said form;

a locking member;

means for mounting said locking member on said second wall;

means for moving said locking member generally laterally into said groove to define a locking position in which said first and second walls are interconnected generally along

said locking edges and for moving said locking member generally laterally out of said groove to define a releasing position; and

the movement of said locking member generally laterally into said groove drawing said locking edges generally toward each other.

15. A prefab form for concrete comprising:

a plurality of walls including first and second walls, said first and second walls having locking edges;

means for pivotally interconnecting said walls while leaving said locking edges disconnected whereby said walls can be arranged to substantially circumscribe a region into which concrete can be poured, said first and second walls being pivotable to move said locking edges toward and away from each other;

means on said first wall defining a recess;

a locking member;

overcenter toggle means including a link pivotally mounted on said first wall and connecting means pivotally mounted on said link for drivingly connecting the locking member and the link; and

said link being pivotable to a locking position in which said toggle means retains at least a portion of said locking member in said recess, said second wall being engageable with said locking member in said locking position whereby said first and second walls are connected adjacent said locking edges, said link being pivotable to a releasing position in which said walls are allowed to separate along said locking edges.

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