

[54] **FORM SYSTEM UTILIZING CONE FLANGES, FORM TIES, AND FORM LOCKS**

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[22] Filed: **Jan. 31, 1972**

[21] Appl. No.: **221,978**

**Related U.S. Application Data**

[63] Continuation-in-part of Ser. No. 827,443, April 14, 1969, Pat. No. 3,638,904, which is a continuation-in-part of Ser. No. 563,011, June 11, 1966, Pat. No. 3,482,813.

[52] **U.S. Cl.**..... 249/213, 249/40, 249/219 R

[51] **Int. Cl.**..... **E04g 17/06**

[58] **Field of Search** ..... 249/213, 214, 215, 216, 249/217, 218, 219 R, 219 W, 38, 39, 40-46, 190, 191

**References Cited**

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*Primary Examiner*—J. Spencer Overholser

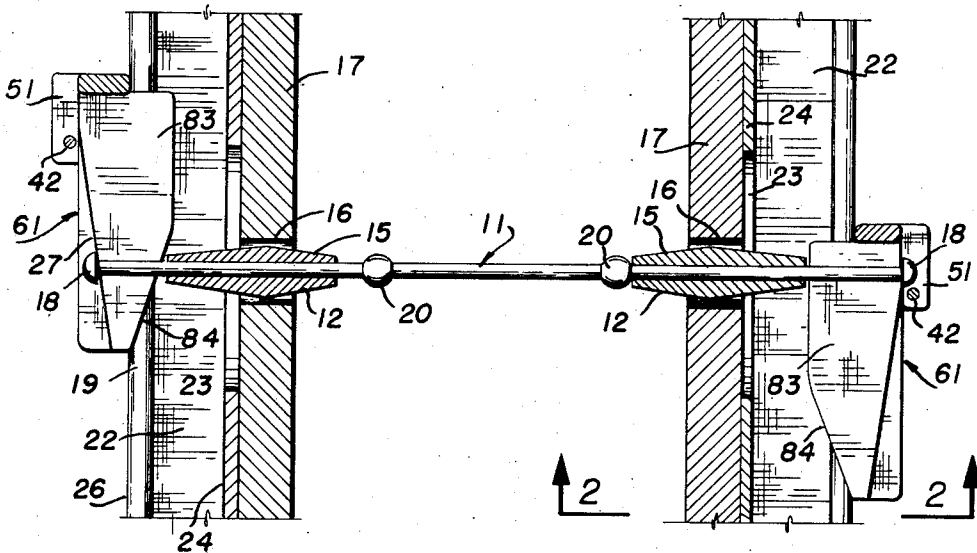
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[57] **ABSTRACT**

A form system utilizing a cone type device, form ties and form locks cooperatively to facilitate the erection of concrete forming systems. The cone devices used facilitate the placement of the form ties and provide, with the form ties, a form lock spacer for maintaining an accurate spacing of the form walls before concrete is poured notwithstanding the fact that the cone devices are of size slightly smaller than the size of the tie openings in the form elements for passage freely therethrough. In use the cones are placed on the ties for engagement between the form locks and a shoulder, a crimped section protuberance, or a threaded section on the ties in order to obtain the desired spacing of the concrete forms.

**5 Claims, 4 Drawing Figures**



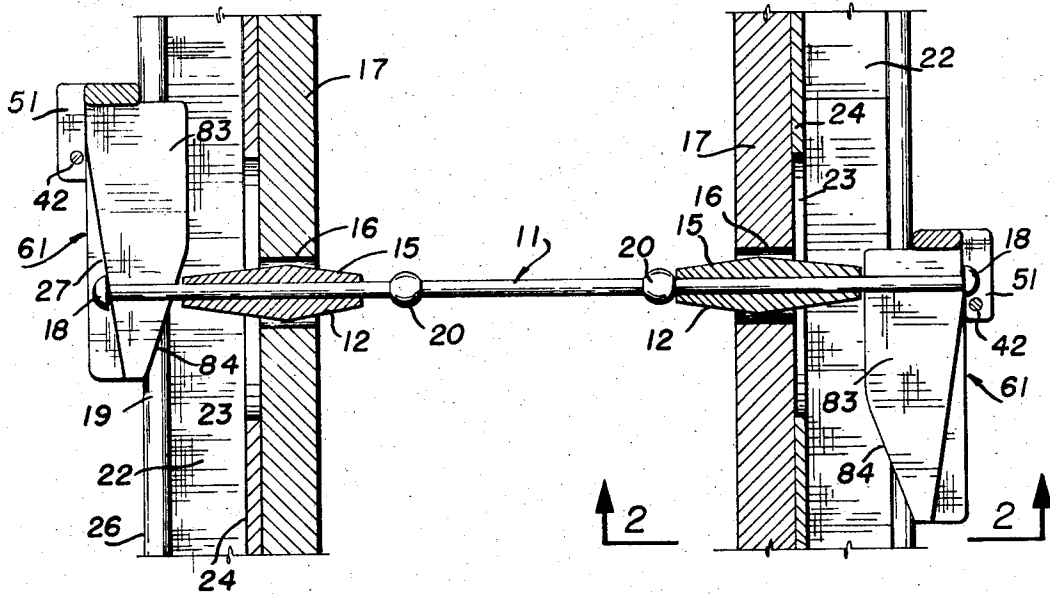


FIG. 1

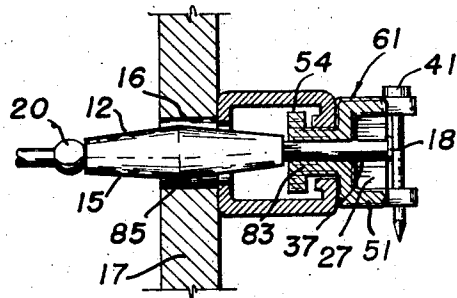


FIG. 2

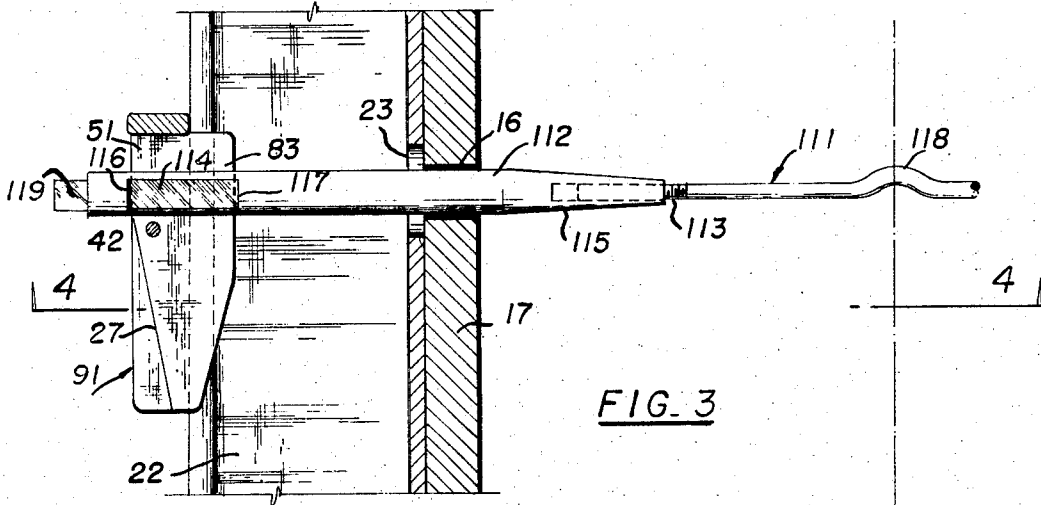


FIG. 3

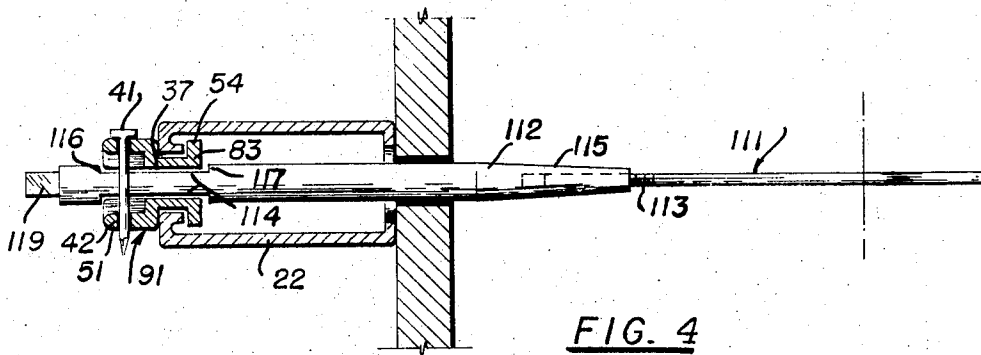


FIG. 4

## FORM SYSTEM UTILIZING CONE FLANGES, FORM TIES, AND FORM LOCKS

### CROSS-REFERENCES TO RELATED APPLICATIONS

The present application is a continuation-in-part of a previous application Ser. No. 827,443 filed April 14, 1969 now issued as U.S. Pat. No. 3,638,904. This previous application was itself a continuation-in-part of application Ser. No. 563,011 filed June 11, 1966, now U.S. Pat. No. 3,482,813. The claimed subject matter of the present application relates back to the first mentioned previous application but is most closely related to the subject matter of the second named application.

### BACKGROUND OF THE INVENTION

The present invention provides improvements in the field of concrete forming and, more particularly, in the presently expanding field of gang forming operations. In such gang forming operations large form panels are utilized that are moved into operative position in a pre-assembled relation so that walls and surfaces of extended length may be formed speedily for unitary pouring. After use the panels in their still assembled relationship are removed to other points for reuse.

In connection with such gang forming operations it is highly advantageous to provide a system that can be erected from work stations outside either of the opposed form walls. A form tie and wedge lock combination for facilitating such operations is disclosed in the mentioned U.S. Pat. No. 3,482,813. The present invention is directed to the types of cone elements or concrete plugs initially disclosed in said patent and to further uses thereof that have been found to be advantageous. Specifically the invention is directed to a combination wherein cone elements, form ties and wedge locks of changed design are used in place of the combination shown and claimed in U.S. Pat. No. 3,482,813 to provide a forming system of comparable utility and improved efficiency.

### SUMMARY OF THE INVENTION

The present invention provides cone elements of size corresponding to the size of form tie openings provided in concrete form work so that the cone may be passed directly through such tie openings. The exterior size and shape of the cone is designed to closely engage the walls of the tie opening so that poured concrete will be prevented from escaping therefrom. The cone elements are provided with a forwardly disposed surface of tapered contour so that the forward end is of smaller size than a rearwardly disposed main body of the cone elements. The forwardly tapered surface provides a self-finding feature that will facilitate the introduction of the cones into the tie openings and will also facilitate the introduction of the form tie elements notwithstanding the fact that the ties are being emplaced from a work station outside the form structure. The cones are used in combination with a form tie and form lock to not only facilitate erection of the forms but further to maintain the forms in properly spaced relationships before, during and after the concrete is poured. The form spacing functions are obtained by cooperative action of the cone element and guiding surfaces on the form locks. Outward movement of the forms is controlled by a shoulder on the tie or on the cone device, while in-

ward movement thereof is limited by the cone and crimped sections, shoulders, or protuberances formed on the tie at a position disposed inwardly of the form panels or by a second shoulder on the cone device itself.

Some of the objectives of the present invention are as follows:

To provide a forming system utilizing ties in which the ties may be conveniently inserted through the form system from a position outside either of the exterior form walls.

To provide a form wall system that is useful in connection with gang forming operations.

In a concrete forming system to provide cone elements for facilitating the emplacement of form ties form work stations outside the form structure, and further to provide a concrete forming system in which the spacing and alignment of the forms in their prepoured or in the poured condition is gauged from and controlled by the positioning of shouldered sections on the ties or cones.

To provide a system as set forth above in which a cone element and form lock operate cooperatively to maintain said desired wall spacing even though there is no direct movement limiting engagement between the cone flanges and the form walls.

### BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a top view in partial section showing form locks in engaged positions and illustrating a first combination embodiment,

FIG. 2 is an end elevation taken from the position of line 2—2 of FIG. 1,

FIG. 3 is a top view in partial section showing the system as used with a she-bolt - cone combination, and

FIG. 4 is an end elevation taken along the line 4—4 of FIG. 3.

The described FIGURES are in part duplicates or adaptations with some of the illustrations previously presented in application Ser. No. 827,443 now U.S. Pat. No. 3,638,904. FIGS. 1 and 2 of the present application are directly related to FIGS. 6 and 7 of the previous application.

### DESCRIPTION OF THE PREFERRED EMBODIMENTS

A special feature of the invention is the provision of a combination of elements mutually adapted one to the other so that the form ties may be inserted through the form accessories and through paired form walls from a position outside either of the form walls. Through use of this feature both form walls may be positioned in approximate aligned relationships and thereafter the rod ties may be introduced through the paired walls from a working station outside the form walls. Notwithstanding such improved ease of erection, the form system still holds the form walls in desired aligned relationship both before the wall is poured and thereafter.

The present invention is primarily concerned with the provision of a form system combination that may be used in conjunction with forming systems where simplicity of erection and handling is paramount. As set forth in the mentioned previous patents, it is desirable to provide a form system that used form panels of large size or gang forms that may be moved unitarily to positions of use and reuse. When gang forms are used, it is inconvenient to work from a station inside opposed

forms to place the form ties. The mentioned previous patents provided systems whereby the form ties could be placed from a work station outside either of the opposed form walls. Systems incorporating such facility of useage are illustrated and described in the previous patents and features of a similar system are shown herein.

FIGS. 1 and 2 present a new form tie, wedge lock and cone combination, the use of which is similar to that described in the previous U.S. Pat. No. 3,482,813. Actually most of the structural features of this embodiment of the invention are identical with the elements illustrated in FIGS. 7 and 8 of the mentioned patent. Accordingly, the same numbering for the parts and components is maintained except that the form locks are changed and are now designated by the number 61. This change in numbering is occasioned by reason of the fact that the head enclosure 32 is omitted from the form lock. The form lock sidewalls 51 are still provided so that the nail opening 42 is preserved, but the cross head which provided the surface 29 is eliminated. This surface can be eliminated and the forming system will still operate to maintain the form walls 17 in adjusted position before the wall is poured, since cone-flanges 12 are disposed between the crimped sections 20 and the foot elements 54 on the extensions 83. The surface extensions 83 and the tapered edges 84 of wedge locks 61 shown in FIG. 1 engage the outwardly disposed or insertion ends of the cone-flanges 12 and tend to move such cones to the operative engaged position shown at the right in FIG. 1. With this arrangement inward movement of the form walls is resisted by engagement of the cone 12 against the crimped section 20, while the outward movement is still resisted by the shoulder or button head 18. For this embodiment of the invention the cone-flanges 12, accordingly, serve a further and additional beneficial purpose by holding the form walls in desired position notwithstanding the fact that there is no direct movement limiting engagement between the cone-flanges 12 and the form boards 17. The cone elements 12 used in this combination are preferably of a harder type of plastic material so that these cones are free to move along the shank of the form ties being used. The forwardly extending conical shape will still serve its hole-finding function when the ties are being placed, however, since the tie inserting movement will itself tend to bring the cone rearwardly against the crimped section 20.

The cone elements 12 still serve additional purposes, however, since they facilitate the breakback functions for the ties. If the ties are to be broken off at a point within the poured concrete wall, the ties are provided with a notch, or the crimped section 20 may be reduced to such size as to facilitate removal of the tie ends by twisting or bending after the forms have been removed. When the tie end is thus removed, a hole is left in the formed concrete wall that will be of conical shape. This opening may be closed by a grout emplacement to derive a smooth face for the wall.

For the particular cone elements to be used with this embodiment of the invention, harder or less resilient compounds may be used for molding the cones. The harder materials serve to maintain the wall spacing better, and the tie ends have a lesser freedom to flex when the form locks are struck to apply or release the form locks. A further advantage of the form lock 61 shown in FIGS. 1 and 2 is related to this same problem. In

form lock 61 the tie head 18 is exposed, and, accordingly, restraint can be applied directly thereagainst when the form lock is being engaged or removed to eliminate flexure of the tie. When the rod or tie is restrained, a single hammer blow will release a form lock so the gang forms can be easily stripped for unitary movement to a next work station.

A separate embodiment of the invention is shown in FIGS. 3 and 4, where the features of the invention are utilized in connecton with a she-bolt type of forming system. For this embodiment the form lock 91 is again provided with the foot elements 54 and extensions 83 for engagement with a form waler 22. As in the previous embodiment, form lock sidewalls 51 are provided. The form lock again has a wedge surface 27 that is divided by a longitudinal slot 37. The sidewalls 51 provide an opening 42 for the reception of a pin or nail 41. This type of form lock is to be used with a she-bolt combination in which the she-bolt tie 111 is provided with threads 113 on the ends thereof. A she-bolt - cone device 112 having internal threads is engageable to the ends of the tie 111. The inwardly disposed ends 115 of the she-bolt - cones 112 are again tapered to facilitate insertion from a work station outside the forms. The opposite ends of the she-bolts have cut or stamped grooves 114 on opposed surfaces to provide outer and inner shoulders 116 and 117. A reduced section for the she-bolt defined by the opposed grooves 114 is adapted to pass through the longitudinal slot 37 of the form locks 91 and to be closely engaged thereby. The shoulder 117 will be engaged by the foot elements 54 of extensions 83, while the shoulder 116 is engaged progressively by the wedge surface 27 as the form lock 91 is moved into the locked position. When in proper position, a pin or nail 41 is inserted through the opening 42. Thereafter the she-bolt and tie combination will serve to hold the form wall 117 in proper position.

As in the previous embodiments, the she-bolt - cone 112 passes through an opening 23 in the waler 22 and closely engages an opening 16 in the form wall 17. This close engagement prevents escape of poured concrete. The she-bolt itself has a bent section 118 that is to be engaged by the poured and cured concrete. This bent section prevents rotation of the tie 111 when the forms are to be removed. To accomplish form removal the form locks 91 are disengaged from the she-bolts - cones 112, and thereafter this element is rotated to disengage the threads 113. When the she-bolt - cone is thus removed, a tapered recess will be left in the concrete that again may be filled with grout to provide a smooth wall. A squared end section 119 on the she-bolt - cone may be engaged by an ordinary wrench to facilitate rotation for tie engaging or disengaging operations.

The form locks 91 can be made identical with the form locks 61 previously described. The form lock embodiments are, accordingly, adaptable to both types of useage. In either embodiment the form locks engage a cone type element, the position of which is established with respect to a tie. This first engagement with the tapered edges 84 and then with extensions 83 prevents inward movement of the form walls before the walls are poured. The engagement of the outer shoulder 116 in the form lock is similar to the previous interengagement of the form lock and tie head 18. This engagement prevents the form walls from moving outwardly before and as the concrete is poured.

We claim

1. A forming system for use in the erection of forms for concrete structures in which a plurality of form panels having tie admitting openings therethrough are used to retain concrete that is to be poured comprising a rod type form tie having an elongated longitudinally extending shank for disposition between form elements, form lock engaging elements on said tie disposed apart a distance greater than the thickness of the concrete structure to be poured and of size larger than the shank of said tie and smaller than the openings in said panels, a form reinforcing element, a wedging form lock engaged to said reinforcing element with the wedging elements thereof movable toward and away from said panel openings but restrained to move only with said forms in directions aligned with the longitudinal disposition of said form ties, means on said wedging form lock for contact with said engaging elements to limit outward longitudinal movement of said form lock with respect to said form tie, a cone-flange element of size corresponding to the size of said panel openings yet smaller than said openings whereby said cone-flanges and the engaging elements may be introduced through paired panel openings from a work station outside either form panel with the engaging elements disposed outwardly of said forming panels and with the cone-flanges disposed adjacent said openings for preventing the loss of poured concrete through said panel openings, a cone-flange engaging section of said form tie of size larger than the body of said tie yet smaller than said openings disposed at a position inwardly of said cone-flange to prevent inward movement of said cone-flange and holding said cone-flange in position with the insertion end thereof exposed and extending outwardly of said form panels, said wedging form lock additionally providing an inwardly disposed surface for engaging the insertion end of said cone-flange whereby inward longitudinal movement of said form lock with respect to said form tie is limited by said cone-flange whereby the form panels and forms are held in adjusted longitudinal position as, before and after the wall is poured.

2. Structure as set forth in claim 1 wherein the inwardly disposed surface of said wedge lock for engaging the insertion end of said cone-flange is a wedge surface.

3. A forming system for use in the erection of forms for concrete structures in which a plurality of form panels having tie admitting openings therethrough are used to retain concrete that is to be poured comprising a form tie having an elongated longitudinally extending shank for disposition between form elements, she-bolt

form lock engaging elements disposed apart a distance greater than the thickness of the concrete structure to be poured and of size larger than the shank of said tie and smaller than the openings in said panels, a form reinforcing element, a wedging form lock engaged to said reinforcing element with the wedging elements thereof movable toward and away from said panel openings but restrained to move only with said forms in directions aligned with the longitudinal disposition of said form ties, means on said engaging elements for contact with said form lock for limiting outward longitudinal movement of said form lock with respect to said engaging elements and form tie, a cone-flange section for said engaging elements of size corresponding to the size of said panel openings yet smaller than said openings whereby said engaging elements and the cone-flange sections thereof may be introduced through paired panel openings from a work station outside either form panel with the insertion ends of said engaging elements disposed outwardly of said forming panels and with the cone-flange sections thereof disposed adjacent said openings for preventing the loss of poured concrete through said panel openings, a cone-flange engaging means on said form tie for preventing inward movement of said cone-flange section and holding the cone-flange section in position with the insertion end of said engaging elements exposed and extending outwardly of said form panels, inwardly disposed shoulder means on said engaging elements, and an inwardly disposed surface on said wedge lock for engaging the said shoulder means of said engaging elements whereby inward longitudinal movement of said form lock with respect to the form tie and engaging elements is limited and the form panels are held in adjusted longitudinal positions as, before and after the wall is poured.

4. Structure as set forth in claim 3 wherein a transversely disposed groove is provided on said she-bolt engaging elements for the formation of shoulders thereon and wherein said shoulders are engaged by the form lock to limit outward longitudinal movement and to prevent inward longitudinal movement of said form lock with respect to said form tie and she-bolt engaging elements combination.

5. The forming system as set forth in claim 4 wherein a threaded end is provided on said form tie and wherein internal threads are provided at the cone-flange section of said she-bolt engaging elements for interengagement with the threads of said form tie.

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UNITED STATES PATENT OFFICE  
CERTIFICATE OF CORRECTION

Patent No. 3,806,080 Dated April 23, 1974

Inventor(s) James W. Franklin et al.

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

On the cover sheet insert -- The portion of the term of this patent subsequent to December 9, 1986, has been disclaimed. --.

Signed and sealed this 24th day of December 1974.

(SEAL)

Attest:

McCOY M. GIBSON JR.  
Attesting Officer

C. MARSHALL DANN  
Commissioner of Patents