Dec. 9, 1969 D. R. WELLS ET AL 3,482,813

WEDGE FORM AND GANG FORMING SYSTEM

Filed June 21, 1966 2 Sheets-Sheet 1

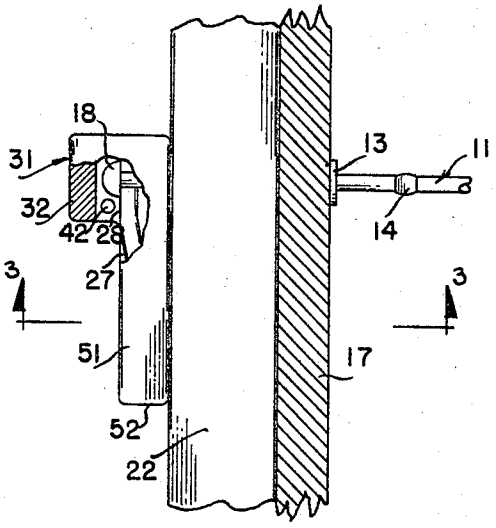


FIG. 1

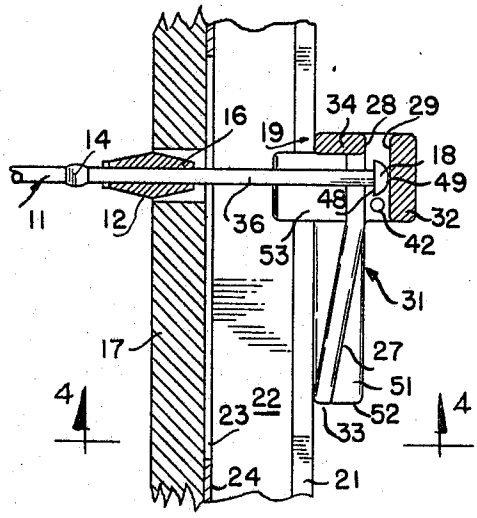


FIG. 2

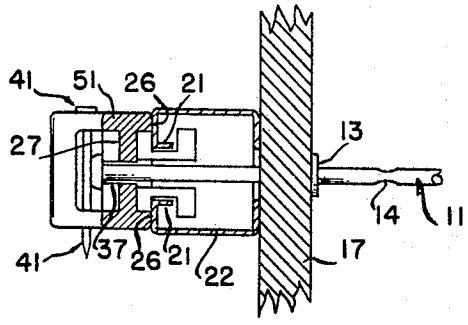


FIG. 3

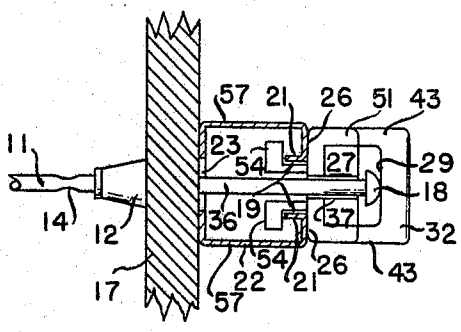


FIG. 4

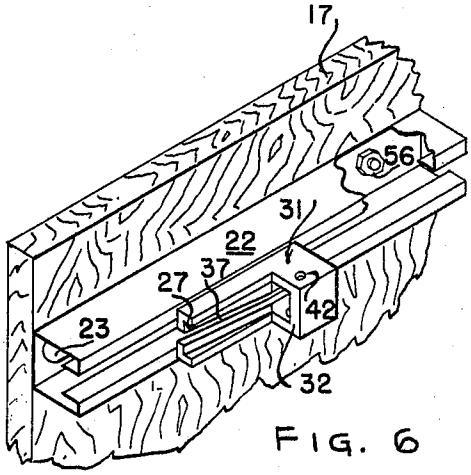


FIG. 6

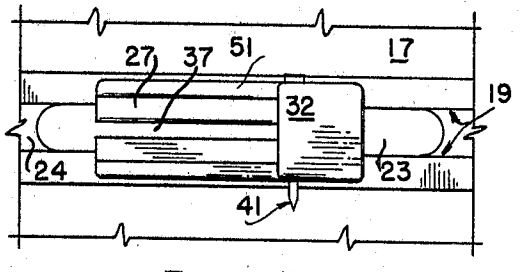


FIG. 5

INVENTORS
DAVID R. WELLS
ELMER H. SCHELL
JAMES W. FRANKLIN
BY
ATTORNEY

Dec. 9, 1969 D. R. WELLS ET AL 3,482,813

WEDGE FORM AND GANG FORMING SYSTEM

Filed June 21, 1966 2 Sheets-Sheet 2

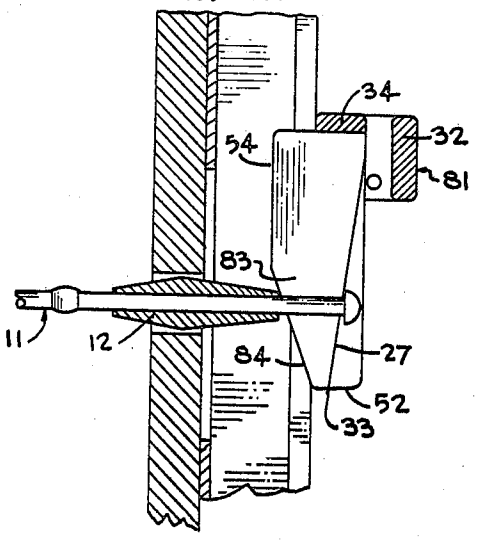


FIG. 7

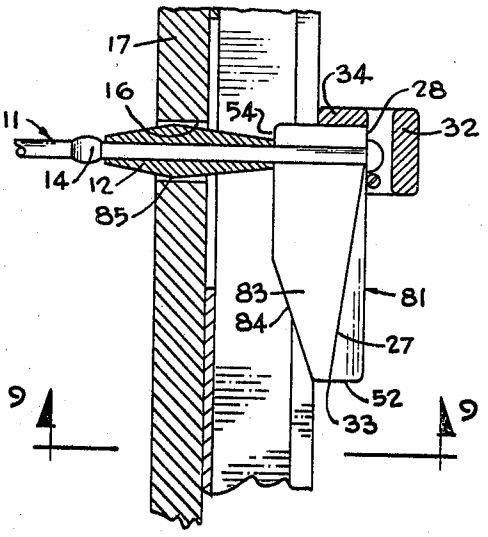


FIG. 8

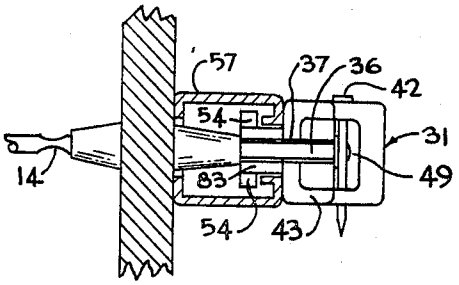


FIG. 9

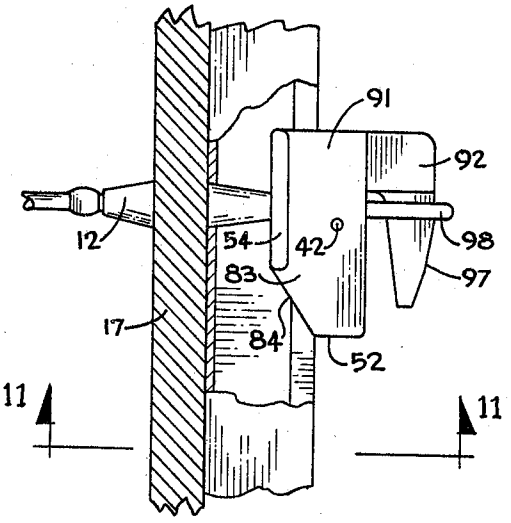


FIG. 10

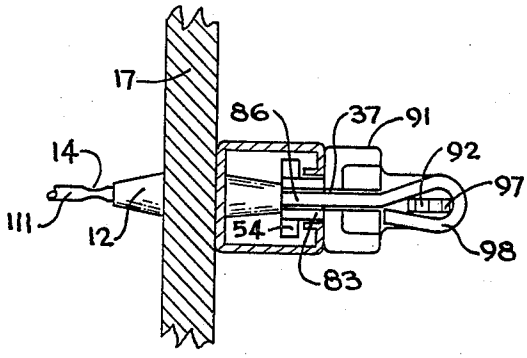


FIG. 11

INVENTOR.
DAVID R. WELLS
ELMER H. SCHELL
JAMES W. FRANKLIN
BY
ATTORNEY

United States Patent Office 3,482,813 Patented Dec. 9, 1969

3,482,813

WEDGE FORM LOCK AND GANG FORMING SYSTEM

David R. Wells, 9260 Hooker St.; and Elmer H. Schell, 3451 W. 94th Ave., both of Westminster, Colo. 80030; and James W. Franklin, P.O. Box 8301, Albuquerque, N. Mex. 87108

Continuation-in-part of application Ser. No. 511,480, Dec. 3, 1965. This application June 21, 1966, Ser. No. 563,011

Int. Cl. E04g 17/00

U.S. Cl. 249—46 9 Claims

ABSTRACT OF THE DISCLOSURE

A wall form system for poured concrete walls utilizing form tie wall reinforcing members having enlarged sections at opposite ends of the ties for engagement by form lock elements that are disposed exteriorly of the wall forms and are movably engageable therewith for transmitting the load resisting strength of said ties to the form walls in which all elements of the form ties are of a size and configuration to facilitate introduction of the ties through paired openings in prepositioned opposed form wall members from access positions outside either wall form for engagement with the form lock elements and in which the tie and form lock combination further serves a wall spacer function restricting relative reciprocal motion of the wall forms along the axis of said wall tie whereby the wall forms are held in desired aligned and spaced positions as, before and after the wall is poured. Flange elements may be provided on the form ties to occlude the openings in the wall forms, and elements on the form locks may be used to hold the flange elements in desired position.

The present application is a continuation-in-part of a previous application filed Dec. 3, 1965, by the same inventors and bearing filing Ser. No. 511,480, now abandoned.

Many previous inventions have been disclosed in which forming accessories were provided to facilitate concrete form erection and usage. In general, the objectives of all previous form locks and form ties have been similar to the overall objectives of the present invention, inasmuch as it has long been recognized that it is important to be able to speedily erect forms when concrete is to be used as a structural material. Further, others have been concerned with the problem of aligning a set of forms and in maintaining the alignment for such forms until the structure has been completed.

In addition to the economic advantages of a form system which can be speedily erected, the industry has also recognized that it is advantageous to have form elements that can be easily dismantled and removed for storage or transportation.

The overall objectives of the present invention include these desirable functions, but it is believed that the structure and ideas here presented satisfy such overall objectives in a more efficient and economical manner. In the satisfaction of such overall objectives, it is recognized that other additional and specific advantages are likewise met. Some of these further objectives are:

To provide a form lock and forming system utilizing rod ties which is of such overall construction that the ties may be inserted through the form system from a position outside either of the exterior walls;

To provide a form lock which may be positioned to engage the button end of a rod tie to maintain associated form accessories and the form wall in desired position before and after the filling of the forms;

To provide a form lock and tie 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 position of the rod tie ends;

To provide a drive type of form lock for use with rod ties so that the form locks may be easily removed after a wall has been poured by hammer blows delivered against the form lock;

To provide a form tie system inclusive of a form lock and a button type rod tie in which elements of the form lock engage a shoulder of said button and tie or the exterior surface of the button itself to hold the form locks and all associated accessories in desired aligned positions;

To provide a rod type form tie which may be provided with wall flanges and that may be scored to provide a breakback feature which can be emplaced through both prepositioned form walls to hold said form walls in desired alignment;

To provide a form wall system using rod ties and hammer driven wedge form locks wherein the rod ties may be inserted through both previously positioned form walls to be engaged and held by said form locks;

To provide a form wall system that is useful in the gang setting of form elements;

To provide a form lock satisfying the foregoing objectives and further providing guide means for accurately positioning cone flange elements;

To provide a form lock and tie system satisfying the foregoing objectives in which a loop type form tie is used;

To provide a tie system inclusive of a drive type form lock in which surfaces of the form lock serve to ac- flange elements;

To provide a form lock and tie system having the indicated characteristics which may be used with a gang forming system so that entire panels can be preassembled for subsequent erection and placement; and

To provide a wall forming system incorporating features of the previous objective in which the tie may be inserted through the form system from a position outside either of the exterior wall forms.

Further objects and advantages of the present invention will be apparent from the appended description and drawings, in which

FIG. 1 is a top view in partial section showing a form lock in locked position on a form tie and disposed against a metal type waler on the form walls,

FIG. 2 is a cross-sectional top view showing structural features of a similar embodiment but further incorporating a cone that may be embodied in a poured wall to facilitate the breaking of breakback form ties,

FIG. 3 is a cross-sectional end elevation taken along the line 3—3 of FIG. 1,

FIG. 4 is a cross-section end elevation taken along the line 4—4 of FIG. 2,

FIG. 5 is a side elevation showing openings through said metal waler,

FIG. 6 is a perspective drawing showing application of the metal waler to the form boards,

FIG. 7 is a top view in partial section showing a modified type of form lock in partially engaged position,

FIG. 8 is a top view in partial section showing the form lock of FIG. 7 in fully engaged position,

FIG. 9 is a cross-sectional end elevation taken along the line 9—9 of FIG. 8,

FIG. 10 is a further modified type of form lock used with loop type ties wherein parts of the form wall system are shown in cross-section, and

FIG. 11 is an end elevation in partial cross-section taken along the line 11—11 of FIG. 10.

Briefly stated, the present invention provides a driven wedge type of form lock which is provided with feet for engagement with a specially formed waler so that the form lock may be moved longitudinally along the waler to positions of use. The form lock itself provides elements for engaging a rod type of form tie, and specifically the button end thereof, whereby the tie and form lock combination establishes the desired positioning of all form elements whether the wall is in the prepoured or poured condition. 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 well is poured and thereafter, since the form lock includes structural features which locate the form wall with respect to the rod tie button end in the prepoured or poured condition. Modified embodiments of the invention provide means for accurately positioning a cone shaped flange element that is used so the tie ends may be broken away from the wall after the forms are stripped. The new embodiment of the invention prevents interference between the wedge form lock and such cone flanges. A further embodiment of the invention makes the novel features of this development available for use with loop type ties. Specific details and structural features of preferred embodiments of the invention are shown in the accompanying figures.

FIGS. 1 and 2 are essentially top plan views of a single embodiment of the invention with various parts being shown in better detail due to the particular cross-sections illustrated. FIGS. 3 and 4 are end views along lines **3—3** and **4—4**, respectively, to further illustrate features of construction. The FIG. 3 and FIG. 4 illustrations differ from those shown in FIGS. 1 and 2 only to the extent that FIGS. 2 and 4 show use of a double ended cone flange element **12** in place of the normal washer type flange or shoulder **13**. These flange elements may be used interchangeably on the rod type form ties **11** depending on whether it is desirable to provide a breakback function for the ties **11** or not. If the rod ties are to be broken off at a point within the poured concrete wall, the ties are provided with a notch or struck indent section **14**. If the wall surface is to be smoothed over so that the tie location is closed off, it is advisable to use the cone shaped flange **12** which will leave a cone shaped indent in the wall when the flange **12** is removed therefrom, and the rod tie **11** is broken off at the notch **14**. All other details and features of the illustrations are comparable one to the other.

Whether the cone shaped flange **12** or the washer flange **13** is used, it should be noted that these elements should be of a diameter slightly less than the diameter of the holes **16** drilled in the form walls **17**. With this arrangement the rod tie **11**, inclusive of its button end **18** and its flange element **12** or **13**, may be inserted directly through paired openings **16** in prepared form walls **17**. These units likewise conveniently pass through the slot opening **19** defined by the opposed shoulders **21** for the formed metal waler **22**.

It is this pass-through feature which makes it possible to erect each of the opposed form walls **17** in their near assembled relation before any rod tie need to be applied thereto. When the boards or form walls are in their desired position, the rod ties may be inserted through the slots **19** of the walers **22** and through the base openings **23** in the back web **24** of the walers **22** to pass through paired openings **16** in the opposed boards **17**. The button ends **18** of the tie rods **11** will then be disposed outwardly from the face web **26** of the waler a distance sufficient to accommodate introduction of the wedge surface **27** of the form lock **31** beneath the button head **18**. As opposed locks **31** are applied and moved into engagement with the button heads of a single rod tie **11**, the opposed walers **22** and their associated form boards **17** will be moved into their desired spaced relationship as the button ends **18** progress along the wedge surface **27** to be received between the opposed parallel surfaces **28** and **29** of head enclosure **32** on wedge form lock **31**.

As shown in FIG. 2, the wedge surface **27** is itself divided by a longitudinal slot **37** which continues from the entrance edge **33** to a stop element **34**. This slot **37**, as shown in FIGS. 3 and 4, is wide enough to provide free passage for the shank portion **36** of the tie rods **11**, but the button head **18** cannot pass therethrough. Accordingly, the head **18** will at all times be retained above the wedge surface **27** or the parallel surface **28**. When the form lock **31** is in its operating position, the button head **18** will be disposed between the parallel surfaces **28** and **29** of the form lock head **32**. In order to retain the button in this position and to hold the form locks in desired position on the tie rods **11**, a nail **41** may be inserted through the openings **42** which pass through the upper and lower sides **43** of the form lock head **32**. The button head **18** will then be retained within the form lock head **32** with either the shoulder **48** of the button head **18** engaged against the surface **29** or with the exterior dome **49** of the button engaged against the surface **29**.

Since the degree of liberty provided is quite limited, the form locks **31**, walers **22** and form boards **17** will be held in their aligned and adjusted positions by such cooperative interaction of the form locks and rod tie buttons both before and after a concrete wall is poured between the opposed form walls **17**. The prepoured positioning of the form walls is, accordingly, dependent upon the button head rather than upon the positioning of a flange, such as the flange **13**, which is in other forming systems normally disposed interiorally of the form walls to prevent the inward collapse of the walls before the concrete has been poured. In accordance with the present invention, the flanges **12** or **13** merely serve to occlude the openings **16** in the form boards **17** so that concrete will not escape out of the poured wall through the holes **16**.

The combination of elements now described would provide a wedge surface having a cut slot therein adapted to receive the shank of a tie rod so that the button end of the tie would be moved progressively along the wedge surface to be engaged between opposed surfaces of a form lock head which would serve to locate any associated form members with respect to said button ends both before and during concrete wall pouring operations. These named elements could be used in connection with conventional waler systems as long as free passage was provided through the form boards and through or past the walers for any flanges or button ends of the tie rods. Accordingly, it should be understood that the invention is adapted for use with conventional wall forming systems as well as with the system illustrated.

It is believed that the illustrated form system itself, however, provides some additional advantages that inhere to the overall system by reason of additional system elements. In the form lock **31** it has been found advisable to provide side walls **51** disposed on opposite sides of the split wedge surface **27** in order to give said wedge surface further rigidity and further to provide a striking surface **52** against which hammer blows may be directed when the form system is being dismantled after a concrete pour. The side walls **51** are extended at the head section **32** to provide the sides **43** which support surface **29** and provide nail openings **42** in the head **32**. Extensions **53** are formed on the underneath surface of the flat parallel surface **28** in order to support the foot elements **54** which may be engaged beneath the shoulders **21** of metal waler **22**. These extensions and feet necessarily are spaced apart each from each to provide a passageway for the tie rod shank

36. When the feet are engaged beneath the shoulders 21, the form lock 31 can be moved reciprocally along the walers 22 but cannot be removed therefrom except by moving the form locks past the end of a waler segment.

In normal usage a prescribed number of form locks 31 are mounted on a length of waler and are retained thereon for ready access when a wall is being erected. The walers 22 themselves may be bolted directly to the form boards 17 through use of through bolts 56, as shown in FIG. 6. Normally a short length of waler will be extended past the edges of any particular form board so that the form boards themselves will be held in properly aligned and adjusted positions against the walers when the boards are disposed in side-by-side relationship.

The walers themselves are made up of commercially available structures in which the flange sides 57 may be of various dimensions to provide additional or decreased resistance to bending. The particular structural shape shown and usually used is commonly sold and marketed by Unistrut or Elcen. The only modifications required are the punching of elongated holes 23 in the base web 24 and the drilling and punching of holes for the attaching bolts 56. The available sizes for these "Unistrut channels" will provide walers having greater structural rigidity than the commonly used 2 x 4's or 2 x 6's with a considerable savings in the weight of the form system. The total cross-sectional depth of the channels can likewise be less than that of dimension materials having a corresponding section modulus, and, accordingly, the total length of the rod tie can be reduced. This reduction in tie length itself could in effect pay any increase in the cost of metal walers when amortized over the life of one set of form boards alone. Considering the fact that the walers can be reused on new form board panels, it seems advisable that the present embodiment which is fully adapted for use with Unistrut channels be used. Plywood will normally be used for the form walls 17.

The parallel surfaces 28 and 29, the sides 43, and the structure of the head 32 which provides the surface 29 jointly constitute an enclosing structure which tends to limit movement of the rod ties 11. When the button end or shoulder of a rod tie is disposed within the enclosure, longitudinal movement of the form lock 31 with respect to the rod tie is limited by engagement between the end 18 and the surfaces 28 or 29. Reciprocal movement of the form lock on the rod tie is blocked at the higher elevation end of the form lock by the stop element 34. When a nail is inserted through the openings 42, the only remaining avenue for reciprocal movement of the rod tie as defined by the slot 37 is itself blocked by the nail. In such usage the nail is considered to be a latch member which completes the restraint of the rod tie end and serves to hold the form lock in desired position.

Separate embodiments of the invention are shown in FIGS 7 through 11. In FIGS. 7 through 9 a modified type of form lock 81 for use with button ties 11 is shown. In general, this form lock 81 is of the same structure as that described in connection with the FIG. 1 through FIG. 6 illustrations. Accordingly, most of the elements of the new form lock are given the same numbers. A modified construction is provided for the extension elements 53. The modified extensions are, accordingly, given the number 83. These extensions are joined to and support the wedge surface 26 and provide the slot 37 through which the shank portions 36 of tie rods 11 extend.

A change in the configuration for the guide surface extension 53 is the main distinction between this new embodiment and the previous showing. In the form lock 81 a guide surface extension 83 is provided which is itself tapered from the entrance edge 33 back to the outwardly extending foot elements 54. With this construction the cone flanges 12 will be engaged by the tapered edge 84 of the extensions 83 to be urged into the desired position. There will be no tendenecy for the cone flanges 12 to be engaged against the previous extensions 53 thereby preventing convenient assembly of the form locks and ties. When the cone flanges 12 are of proper size and design, they will be moved to a position as illustrated in FIGURE 8 to properly occlude the opening 16 drilled in the form wall 17. The large diameter section 85 of the cone flange 12 will be in position to occlude the holes 16 while the inwardly directed portion of the cone flange extends toward the breakback indent 14 of the tie 11. The outwardly extending cone segment will remain in contact with the innermost extremity of the foot members 54 to that the pressure of the placed concrete will not tend to push the cone flange 12 out through the form board holes 16.

One further change is illustrated in FIGS. 7 and 8. As a minor detail of construction preference, the tapered surface 27 has been extended back to a position interiorly of the head 32. This decreases the length of the flat parallel surface 28. In use it has been found that this shorter section of parallel surface and longer tapered surface 27 is beneficial, inasmuch as less effort is required to release the form lock from a poured wall. Usually one hammer blow delivered against the form lock end 52 is sufficient to move the wedge lock far enough to disengage the button head 18 from the shortened flat surface 28. The taper of increased length, of course, not only provides this easier release feature but also provides a surface of less inclination so that the engaging force is similarly diminished when the system is being assembled.

A further modification of the present invention is shown in FIGURES 10 and 11. Here the beneficial features of the invention are adapted for use with loop type ties. This new form lock 91 is again provided with guide surface extension 83 that support foot elements 54. These foot elements are engageable in an open channel type waler as previously described. The guide surface extensions 83 also provide tapered edges 84 which will move the cone flange 12 into the desired position. Though a guide slot 37 is provided between the extensions 83 to receive the shank 86 of the loop type tie 111, no wedge surface is provided at the outermost termination of such slot. In this embodiment of the the invention the wedge action is obtained through use of a finger element 92 supported outwardly from the form lock 91 and having a tapered wedge surface 97 for engagement with the loop 98 of the loop ties 111. With this construction reciprocal engaging movement of the form lock 91 will tend to tighten the loop ties between opposed wedge surfaces 97. When fully engaged, the finger 92 will also be in near contacting relation with the inwardly disposed portion of the loop 98. The total contacting relationship between the finger 92 and the form tie loop 98 will prevent in and out movement of the form lock 91 to hold the form lock and other form system elements inclusive of the wall panels 17 in desired position.

When the tie is in the fully engaged position, a nail may again be dropped through paired openings 42 in the guide extensions 83 to maintain the elements in their desired positions. After the wall is poured, the nail may be removed, and the form lock can be released by a hammer blow directed against the end 52.

While separate embodiments of the invention have been shown and described, it should be apparent that the invention and the illustrated and described embodiments of the invention are adaptable to various modifications and changes. All such modifications and changes are considered to be a part of this invention as defined in the appended claims.

What is claimed is:

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 form tie having an elongated longitudinally extending shank for disposition between form elements and through said

panel openings, form lock engaging elements on said form 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 for engaging a plurality of form panels, a wedging form lock engaged to said reinforcing element and moveable 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 whereby the ties and engaging elements thereon may be introduced through paired panel openings from a work station outside either form panel to be disposed outwardly of said forming panels, and means on said form lock for contact with the engaging elements of said form tie to limit inward and outward longitudinal movement of said form lock with respect to said form tie whereby said form lock, forming panels and forms are held in adjusted longitudinal positions as, before and after the wall is poured.

2. Structure as in claim 1 wherein said form ties are additionally provided with flange elements of size corresponding to the size of said panel openings yet smaller than said openings whereby said flanges and the engaging elements of the form tie may be introduced through paired panel openings with the said engaging elements disposed outwardly of the forming panels and the flanges disposed adjacent said openings for preventing the loss of poured concrete through said panel openings.

3. A forming system as set forth in claim 2 wherein said form lock comprises a base element, and wedge faces disposed at inclined angles with respect to said base, one of said wedge surfaces being disposed to guide and hold said flange elements in operative position.

4. A forming system as set forth in claim 2 wherein said form lock additionally provides a wedge surface disposed to guide and hold said flange elements in operative position.

5. Structure as set forth in claim 1 wherein the engaging elements of said tie are shoulder elements disposed outwardly from the shank thereof.

6. A forming system as set forth in claim 5 wherein an enclosing structure is provided as the means for limiting inward longitudinal movement of said form lock with respect to said form tie.

7. Structure as set forth in claim 6 wherein a latch member is additionally provided to selectively retain the engaging elements within the enclosing structure.

8. Structure as set forth in claim 5 wherein said form reinforcing element is a waler of channel shape.

9. Structure as set forth in claim 1 and additionally comprising a foot element on said form lock for engagement with said form reinforcing element.

References Cited

UNITED STATES PATENTS

2,107,415	2/1938	Hungerford	249—219 X
2,511,829	6/1950	Arrighini et al.	249—40 X
3,011,242	12/1961	Matheson	249—190 X
3,315,938	4/1967	Gates	249—46
2,338,025	12/1943	Cooper	249—213 X
2,395,204	2/1946	Symons	249—213 X
2,904,870	9/1959	Hillberg	249—219

J. SPENCER OVERHOLSER, Primary Examiner

JOHN S. BROWN, Assistant Examiner

U.S. Cl. X.R.

249—217