July 1, 1969 G. F. BOWDEN 3,452,960

CONCRETE WALL FORM WITH LOAD GATHERING AND DISTRIBUTING MEMBERS THEREFOR

Filed March 31, 1967 Sheet 1 of 2

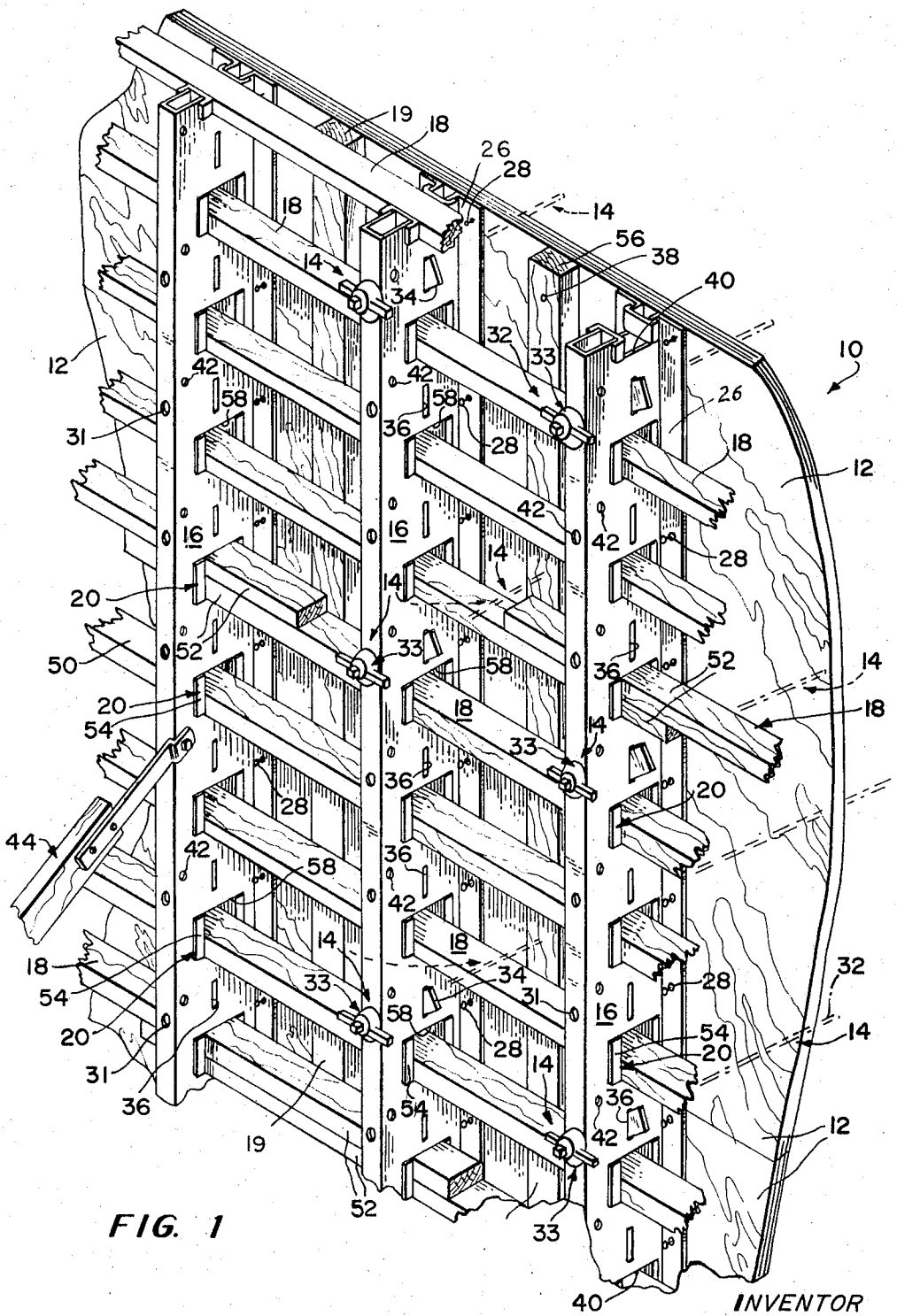


FIG. 1

INVENTOR
GEORGE F. BOWDEN
By Norman Siegel
Attorney

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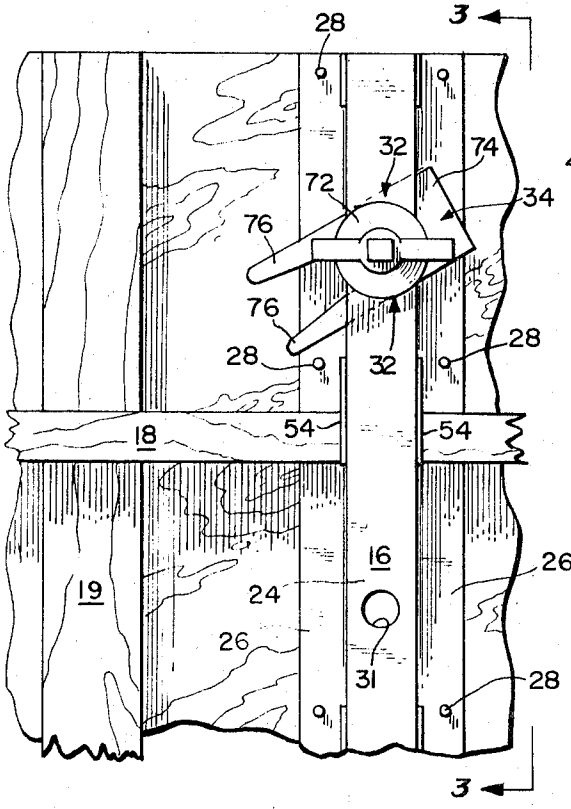


FIG. 2

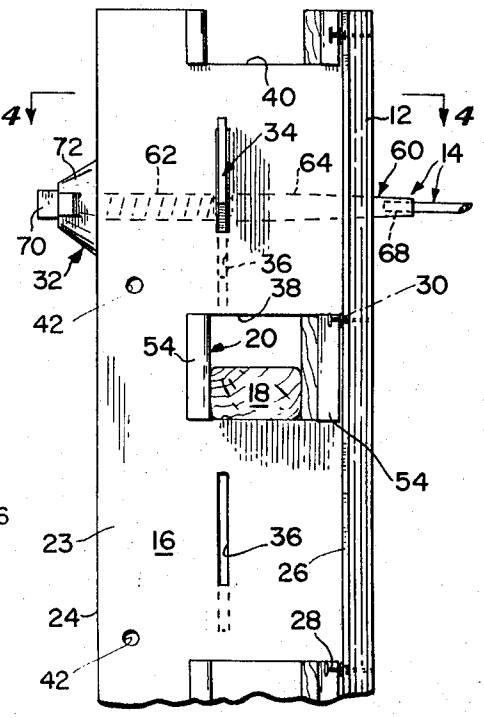


FIG. 3

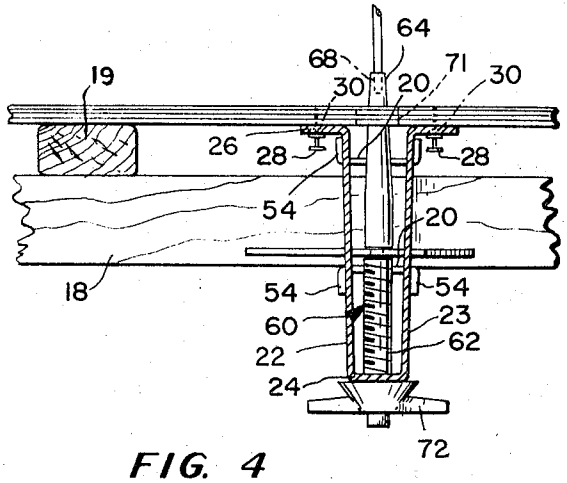


FIG. 4

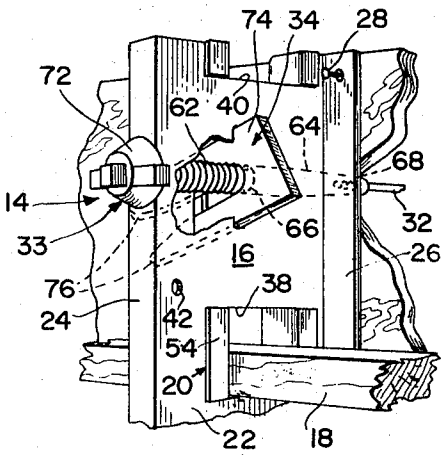


FIG. 5

INVENTOR
GEORGE F. BOWDEN
By Norman Wesbach
Attorney

United States Patent Office

3,452,960

Patented July 1, 1969

3,452,960

CONCRETE WALL FORM WITH LOAD GATHERING AND DISTRIBUTING MEMBERS THEREFOR

George F. Bowden, Northbrook, Ill. 60064

Filed Mar. 31, 1967, Ser. No. 627,512

Int. Cl. E04g 11/18, 17/06

U.S. Cl. 249—40

5 Claims

ABSTRACT OF THE DISCLOSURE

A load gathering and distributing member in the form of a sheet metal waler adapted for vertical positioning in a wall form installation. The member has facilities for attachment to the form sheathing and to certain tie rod fastening devices and it cooperates with a series of specially positioned studs to transfer and substantially equally distribute indirectly to the tie rods the load incident to the outward thrust of the wet poured concrete.

The present invention relates generally to concrete wall forms of the type that comprises two upstanding, spaced apart sides in the form of rectangular plywood panels in edge-to-edge relation, and horizontal, tie rod variety fastening devices between the two form sides. More particularly, the invention relates to a novel load gathering and distributing member which functions as a vertical waler and, when employed in connection with a vertical series of cooperating, horizontally extending studs and also cooperating, specially designed she-bolts and other concrete wall form hardware, serves, in combination with such cooperating parts, to gather the load which is incident to the outward thrust of the poured wet concrete upon the plywood panels of the form and distribute the same among the associated, horizontally extending tie rod variety fastening devices which extend transversely across the form and connect the two sides thereof together. Additionally, the improved load gathering and distributing member or waler, when operatively installed in the wall form along with similar members or walers, affords an extremely rigid panel or sheath-reinforcing structure by means of which the mating panel edges are maintained in accurate vertical and horizontal alignment throughout the entire vertical and horizontal extent of the form. The provision of a load gathering and distributing member or waler of the character briefly outlined above constitutes the principal object of the present invention.

Another object of the invention is to provide for use in connection with a concrete wall form a load gathering and distributing member or waler which is of sheet metal construction to the end that it may be formed from a single blank of such metal by conventional sheet metal forming apparatus and equipment.

A further object of the invention is to provide a load gathering and distributing member which is extremely versatile in its application to various kinds or types of concrete wall forms in that it may cooperate with a varying number of vertically and horizontally disposed studs and horizontal tie rod assemblies to accommodate the requirements of widely different wall form installations, such installations requiring no modification whatsoever of the improved load gathering and distributing member.

A still further object of the invention is to provide for use in connection with a concrete wall form a sheet metal load gathering and distributing member or waler which is capable of cooperating with tie rod assemblies or fastening devices of conventional construction in the performance of its normal load gathering and distributing functions.

Yet another object of the invention is to provide a load gathering and distributing member which is of the particular character set forth above and, in addition, is capable of reuse in successive concrete wall form installations, the dismantling of the particular installation serving to free the load gathering and distributing member and its associated studs and hardware without such damage or distortion as would preclude reuse of the member in another concrete wall form installation.

Other objects and advantages of the invention will readily suggest themselves as the nature of the invention is better understood from a consideration of the following detailed description, such invention consisting in the novel construction, combination and arrangement of parts shown in the accompanying two sheets of drawings forming a part of this specification.

In these drawings:

FIG. 1 is a fragmentary perspective view of one side of a concrete wall form installation employing a plurality of load gathering and distributing members embodying the present invention;

FIG. 2 is an enlarged front elevational view of a fragment of the wall form side that is shown or illustrated in FIG. 1;

FIG. 3 is a vertical transverse sectional view taken substantially along the line 3—3 of FIG. 2;

FIG. 4 is a horizontal sectional view taken substantially along the line 4—4 of FIG. 3; and

FIG. 5 is a fragmentary perspective view of a portion of the wall form side of FIG. 1 and in the vicinity of one of the she-bolts that are employed in connection with the invention and as parts of the fastening devices for the two form sides.

Referring now to the drawings in detail and in particular to FIG. 1, a fragmentary portion of one side of a concrete wall form is designated in its entirety by the reference numeral **10**, and it is comprised of a flat upstanding sheathing in the form of a horizontal series of vertically disposed rectangular plywood panels **12** which are arranged in edge-to-edge contiguity in order to provide said flat sheathing. It is to be understood that the wall form side **10** is opposed by a counterpart wall form side (not shown) of similar construction, and that wet concrete, for wall forming purposes, is poured between the two form sides in the usual manner of concrete pouring operations. After hardening of the concrete, the form is removed, as well understood in the art. The outward thrust of the poured wet concrete between the two form sides is assimilated by way of fastening devices in the form of composite tie rod assemblies which are designated by the reference numeral **14** and extend between the two form sides as is customary in the art. The present invention is concerned primarily with novel means for gathering the load which is applied coextensively to the plywood panels **12** of the form side **10** and distributing this load in a uniform manner among all of the various tie rod assemblies **14**. Briefly, to accomplish this aim, the invention provides a horizontal series of novel spaced apart, vertically extending load gathering and distributing members **16**, three of which are shown in FIG. 1 of the drawings, together with a vertical series of spaced apart, horizontally extending studs **18**, a horizontal series of spaced apart, vertically extending studs **19**, and a plurality of vertical bearing plates **20**, these particular parts, when assembled according to the present invention, effecting the desired load gathering and distributing function in an extremely efficient manner.

More specifically, each load gathering and distributing member **16** for the concrete wall form side **10** is in the form of a vertically elongated sheet metal waler which is generally of U-shape in cross section (see FIG. 4) and comprises a pair of nearly parallel but slightly inwardly or rearwardly divergent sides **22** and **23** and a connecting

web **24** between the outer marginal portions or edges of the two sides **22** and **23**, said sides and web being each substantially planar or flat. The inner edge portions of the sides **22** and **23** of each member **16** are provided with laterally and outwardly turned coplanar attachment flanges **26** by means of which the member may be attached to the outer face of the associated plywood panel **12** in vertically disposed and outwardly or forwardly extending relationship. The attachment is made by driving the shank portions of vertical series of vertically spaced, dual-headed fastening nails **28** through corresponding vertical series of vertically spaced nail holes **30** (see FIGS. 3 and 4) in the attachment flanges **26**. The web portion **24** of each load gathering and distributing member **16** is provided with a vertical series of spaced apart, circular openings **31** and these openings are designed for cooperation with a vertical series of the previously mentioned horizontally and transversely extending tie rod assemblies **14** in a manner that will be made clear presently. As employed in this specification and also in the claims appended thereto, the term tie rod assembly may be considered as being generic to any one of the entire aforementioned fastening devices, each such device comprising an expendable tie rod proper **32** which is disposed entirely within the space between the two aforementioned sides of the form and remains permanently embedded in the hardened concrete, a she-bolt **33** on the end of the rod proper that is adjacent to the wall form side **10**, and a cooperating spreader fork **34**, the nature and function of which will be made clear presently. It is, of course, to be understood that the other end of the tie rod proper has a similar she-bolt and a similar spreader fork.

Each side of each load gathering and distributing member **16** is provided with a vertical series of spaced apart, vertically elongated slots **36**, the spacing between the pairs of adjacent slots being equal but the slots in the side **22** being vertically staggered with respect to the slots in the side **23**. In between adjacent slots **36**, each of the sides of each member **16** is provided with a relatively large rectangular stud-receiving opening **38**, while rectangular, notch-like openings **40** are provided in the upper and lower end marginal portions of the sides **22** and **23**, such openings **40** having one-half the vertical dimension of the stud-receiving openings **38**. The various openings **38** and **40** are arranged in pairs which are transversely aligned across each load gathering and distributing member **16** at the same elevation. A vertical series of spaced apart bolt holes **42** is provided or formed in each of the two sides **22** and **23** by means of which each member **16** may have selectively attached thereto the upper end of a suitable thrust reaction brace assembly such as is fragmentarily shown in FIG. 1 and designated by the reference numeral **44**.

In the erection of a given concrete wall form embodying the form side **10**, the various load gathering and distributing members **16** are nailed to the plywood panels **12** so that they extend in parallelism and also vertically as clearly shown in FIG. 1, the dual headed nails **28** being driven into the plywood through the nail holes **30** in the out turned attachment flanges **26**. Thereafter, a vertical series of the previously mentioned horizontal studs **18** is applied to the members **16** by passing the studs endwise through the rectangular openings **38** in the manner disclosed in FIG. 1. In connection with application of the studs **18** to the members **16**, the end regions of adjacent studs are caused to overlap as indicated at **52** in such a manner that each overlapping region finds support on the lower edge of two or more of the openings **38**. Preferably, the studs **18** are in the form of lengths of 2" x 4" wooden stock. Prior to insertion of the studs **18** through the openings **38** in the sides of the load gathering and distributing members **16**, the vertical edges of said opening **38** are lined with the previously mentioned bearing plates **20** in order to protect the studs from the sharp edges of the openings, as well as to distribute the thrust that is exerted by these studs against said vertical edges. The bearing plates **20** are coextensive with and disposed in the side of the members **16** and embody vertical series of spaced apart pairs of integral, laterally extending flanges **54** (see FIGS. 3 and 4) which straddle the portions of the sides of the members **16** that define the vertical edges of the stud-receiving openings **38**. As best shown in FIG. 4, the flanges **54** on the outermost bearing plates **20** extend outwards and the flanges **54** on the innermost bearing plates extend inwards. Certain of the studs **18** may, if desired, be positioned in the notches **40**. As shown in the drawings, the vertical edges of said notches are protected by bearing plates **20**. Also, prior to insertion of the horizontal studs **18** through the openings **38** and the notches **40**, a horizontal series of the vertical studs **19** is positioned against the outer face of the plywood sheathing and arranged so that said studs are disposed midway between adjacent members **16**. The vertical studs **19** may, if desired, be secured in position by the application of a plurality of nails **58**.

At an appropriate time during form-erecting operations, the tie rod assemblies **14** may be applied to the vertical load gathering and distributing members **16**. As best shown in FIGS. 4 and 5, these tie rod assemblies are of conventional construction and as previously stated, each assembly includes a tie rod proper **32** and a she-bolt **33** at that end of the tie rod proper that is adjacent to the plywood panels **12** of the concrete form side **10**. Each she-bolt is comprised of a threaded outer section **62** and a conical inner section **64** of small slant angle, and is provided between the two sections with an annular groove **66**. The free or outer end of the inner section **64** of each she-bolt is socketed and threadedly receives therein the adjacent end of the associated tie rod proper **32**, the threaded connection being indicated by the reference numeral **68** in FIGS. 3 and 5. The free or outer end of the threaded section **62** of each she-bolt is provided with a reduced squared lug **70** for cooperation with a suitable wrench by means of which the she-bolt may be unthreaded from the adjacent end of the associated tie rod proper **32** when dismantling the form as is conventional and well understood in the art. When the tie rod assemblies **14** are properly installed in the wall form side **10**, the unthreaded conical sections **64** of the she-bolts **33** pass through holes **71** (see FIG. 4) in the adjacent plywood panels **12**. The she-bolts **33** of the tie rod assemblies **14** have associated with them wing nuts **72** which, when flush with the outer ends of the threaded sections **62**, establish the predetermined desired breakback in the hardened concrete.

When each tie rod assembly **14** has been properly positioned with respect to the concrete form side **10** as previously described, one of the spreader forks **34** is applied to the she-bolt **33** of the assembly by passing it through the adjacent pair of vertically outset slots **36**. Each spreader fork **34** is in the form of a flat plate having a solid head portion **74** from which there projects in one direction a pair of fork tines **76**. The latter at their distal or free ends are relieved on a curved bias to facilitate entry of the she-bolt between the tines. When the spreader forks are in their home position within the pairs of slots **36**, the fork tines **76** straddle the annular grooves **66** in the central portions of the she-bolts, while the distal end regions of the tines are confined between the vertical side edges of the lowermost slots **36**. The oblique disposition or vertical offset relationship of the slots **36** of each pair serves to locate the associated spreader fork **34** in a correspondingly oblique position where it is maintained in a stable condition against dislodgment under the influence of gravity. The normal tendency is for the fork to settle to its proper position rather than to fall out of position by gravity prior to tightening of the form parts.

With the various parts of wall form side **10** in their proper position as set forth above, the loosely applied wing nuts **72** may then be tightened on the threaded

outer sections **62** of the she-bolts **33**, thus placing the sides **22** and **23** of the load gathering and distributing members **16** under compression in the regions thereof which exist between the slots **36** and the webs **24** (such a region being indicated by the labelled bracket in FIG. 3) and thereby binding these portion securely between the wing nuts **72** and the spreader forks **34** so as to locate the form side **10** in its proper spaced apart relationship with the opposite form side (not shown).

It is to be noted at this point that in the assembled concrete wall form side **10**, the distance between each outer bearing plate **20** and the outer face of the sheathing that is formed by the plywood panels **12** is approximately equal to and preferably slightly less than the combined thickness of the two juxtapositioned studs **18** and **19** in the transverse direction of the form as a whole and that the effective horizontal width of the stud-receiving openings **58** is slightly greater than the major width of one of the horizontal studs **18**. Thus, when wet concrete is poured into the form, that is, between the two opposed but spaced apart form sides, the load is applied in compression through the vertical studs **56**, in flexion through the horizontal studs, in compression through the outer bearing plates **20**, and from thence through the intervening portions of the members **16** directly to the tie rod assemblies **14**, a fairly uniform distribution of the total load being distributed to said tie rod assemblies. It should also be observed that the height of the openings **38** is somewhat greater than twice the minor or vertical transverse dimension of a horizontal stud **18** so that there will be no binding of the horizontal studs within the openings **38** during insertion of said studs therethrough, even where overlapping studs are concerned. The load gathering and distributing efficiency of the members **16** is greatly enhanced by proper positioning of the vertical studs **19** midway between adjacent members **16** where they lie along regions of maximum potential bulging of the plywood sheathing and, therefore, the pressure to which they are subjected will be divided substantially equally and transmitted by horizontal beam deflection in opposite directions along the studs **19** and ultimately to the tie rod assemblies **14** that are associated with the adjacent load gathering and distributing members **16**.

The invention is not to be limited to the exact arrangement of parts as shown in the accompanying drawings or described in this specification as various changes in the details of construction may be resorted to without departing from the spirit or scope of the invention. Therefore, only insofar as the invention is particulary pointed out in the accompanying claims is the same to be limited.

Having thus described the invention what I claim as new and desire to secure by Letters Patent is:

1. In a concrete wall form for receiving poured concrete, in combination, a vertically disposed sheathing presenting an inside face against which concrete is adapted to be poured, and an outside face, a horizontal series of spaced apart, vertically disposed walers positioned against said outside face of the sheathing and secured thereto, said walers each being formed with a plurality of vertically spaced stud-receiving openings therethrough, the openings in adjacent walers being in horizontal alignment and thus providing superimposed horizontal rows of openings through the series of walers, a vertical stud positioned against the outside face of the sheathing substantially midway between each pair of adjacent walers, a horizontal stud projecting through each horizontal row of openings in the walers and in load-transferring contact with the vertical studs, a tie rod assembly including a tie rod proper and a removable she-bolt mounted on one end of the tie rod proper and provided with an annular groove therein, and a removable spreader fork projecting completely and loosely through the associated waler and projecting into said annular groove on opposite sides of the she-bolt for preventing appreciable shifting of the walers on the she-bolt, the combined thickness of said horizontal and vertical studs in the regions of contact therebetween and the disposition of the stud-receiving openings being such that the load of poured concrete is transferred from the sheathing through said vertical studs, said horizontal studs and said walers to the fastening devices successively and in the order named.

2. In a concrete wall form, the combination set forth in claim **1** and wherein each spreader fork has its longitudinal axis extending on an incline from the horizontal with its tines projecting forwardly and downwardly with respect to the axis of the fork.

3. In a concrete wall form, the combination set forth in claim **1** and wherein each waler is in the form of an elongated strip of sheet metal bent to generally U-shape configuration in transverse cross section to provide substantially parallel sides and a connecting web, is positioned with the distal edges of said sides bearing against the sheathing, and has its web spaced from the latter, said stud-receiving openings are in the form of transversely aligned pairs of rectangular cut-outs in said sides and the associated she-bolts of the tie rod assemblies project loosely through the webs of the walers.

4. In a concrete wall form, the combination set forth in claim **3** and including, additionally, elongated bearing plates loosely disposed in, and extending lengthwise of, the walers and positioned adjacent to the vertical edges of the cut-outs.

5. In a concrete wall form, the combination set forth in claim **4** and including, additionally, bearing nuts on the outer ends of the she-bolts and engageable with the webs of said walers.

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J. SPENCER OVERHOLSER, *Primary Examiner.*

DE WALDEN W. JONES, *Assistant Examiner.*

U.S. Cl. X.R.

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