

Nov. 11, 1958

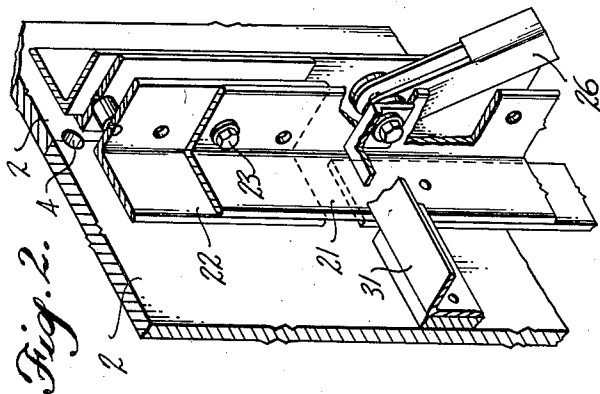
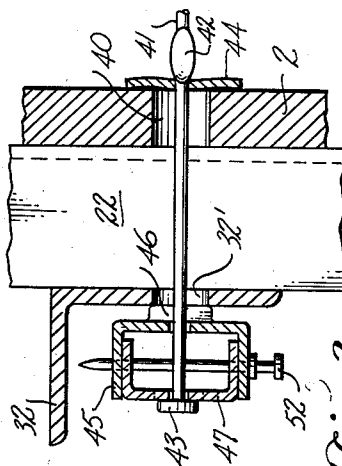
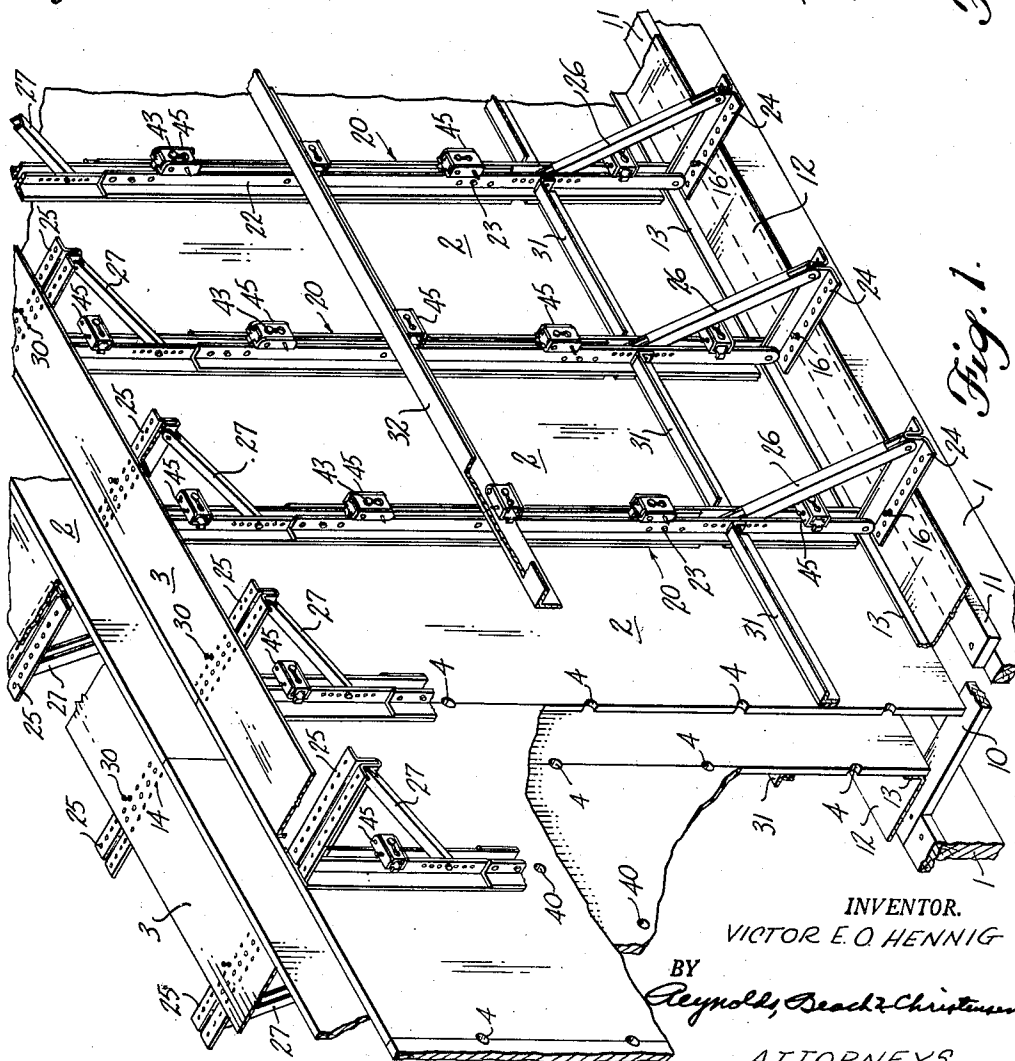
V. E. O. HENNIG

2,859,503

CONCRETE FORM TIE-TENSIONING MEANS

Filed March 16, 1953

2 Sheets-Sheet 1



INVENTOR.
VICTOR E. O. HENNIG

BY

Reynolds, Beach & Christensen

ATTORNEYS

Nov. 11, 1958

V. E. O. HENNIG

2,859,503

CONCRETE FORM TIE-TENSIONING MEANS

Filed March 16, 1953

2 Sheets-Sheet 2

Fig. 4.

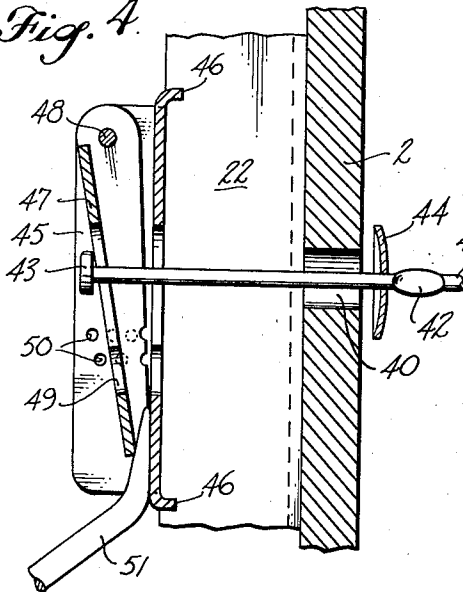


Fig. 5.

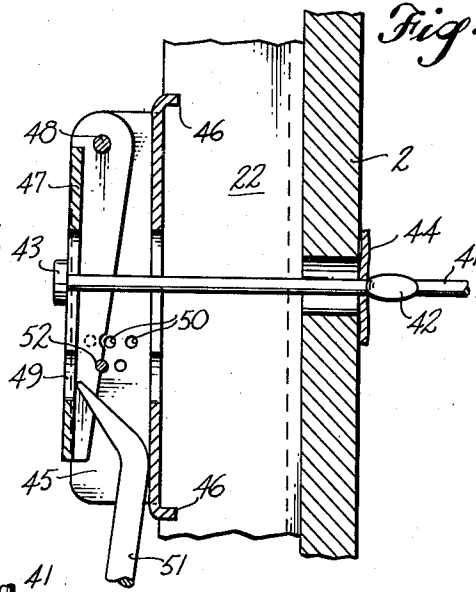
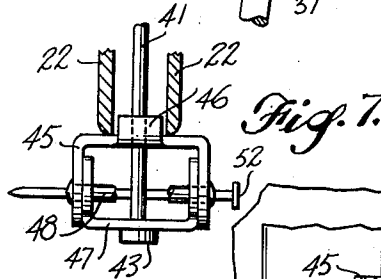


Fig. 7.

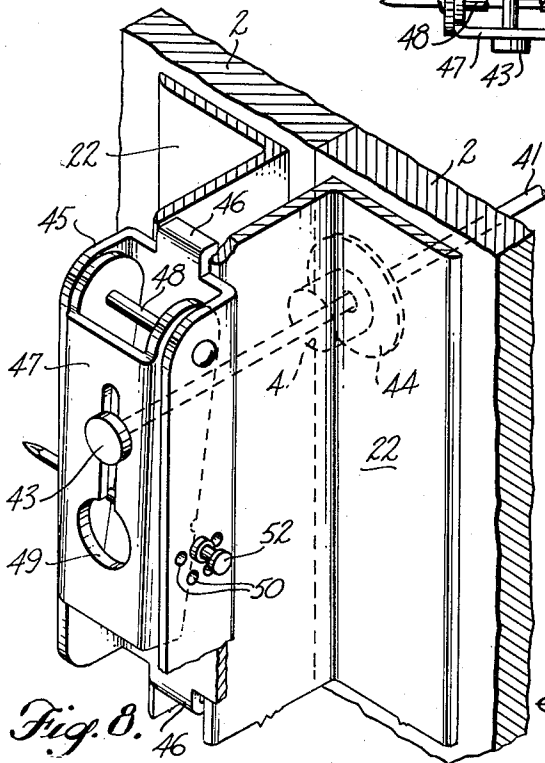


Fig. 8.

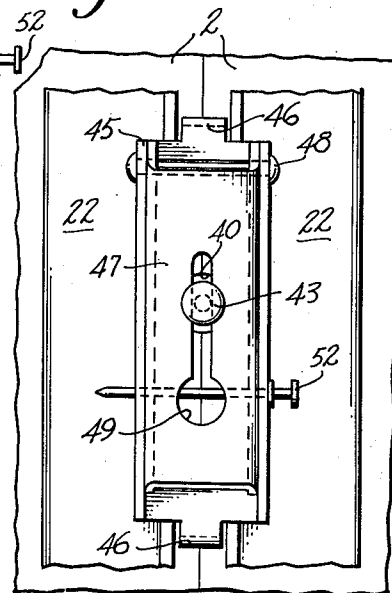


Fig. 6

INVENTOR.
VICTOR E. O. HENNIG

BY

Reynolds, Beach & Christensen

ATTORNEYS

1

2,859,503

CONCRETE FORM TIE-TENSIONING MEANS

Victor E. O. Hennig, Seattle, Wash.

Application March 16, 1953, Serial No. 342,473

2 Claims. (Cl. 25—131)

The concrete form of the present invention includes the combination of a stiff form tie and a tie-tensioning block as particular features of the form construction.

The form tie and tie-tensioning block incorporated in the present invention are best adapted for use with forms employing plywood panels instead of shiplap for the form walls. Such form walls are supported by the usual studs or preferably by quickly demountable studs. In assembling the studs to support the form walls, it is an object to provide connections between the frame members themselves and between such members and the panels, and to minimize the connections between such members.

In the fabrication of forms utilizing the present invention the footing forms may be conventional, being constructed of stringers on edge suitably anchored relative to the ground, such as by stakes driven into the ground and secured together by cleats or battens interconnecting and nailed to their upper edges. On these cleats may be erected the form walls and supporting uprights. Preferably, such form walls are made of plywood panels. Panels braced by the uprights, and the uprights themselves, may be secured in place by form ties, held in place by anchoring devices such as novel expandable tensioning blocks. Walers both for straight wall bracing and for supporting buttress forms may be secured readily to such uprights.

The details of the above-mentioned elements of the novel form structure shown in the accompanying drawings are discussed more fully in the following specific description.

Figure 1 is a top perspective view of a section of concrete wall form with parts broken away. Figure 2 is a top perspective view of a fragmentary portion of such wall form in which parts are broken away.

Figure 3 is a vertical sectional view through a fragmentary portion of the form shown in Figure 1 and through a cross-tie tensioning block.

Figure 4 is a vertical sectional view through a fragmentary portion of the wall form and through a cross-tie tensioning block in relaxed position. Figure 5 is a similar view showing the tensioning block in expanded condition, and Figure 6 is an elevation view of the some portion of the form showing the tensioning block in expanded condition, as seen in a direction perpendicular to the views of Figure 4 and 5. Figure 7 is a horizontal sectional view through the same portion of the form showing the tensioning block in plan and in expanded condition with parts broken away. Figure 8 is a top perspective view of the same portion of a form with the tensioning block in expanded condition.

The form structure to which this invention pertains incorporates three major components, namely the panels, preferably of plywood, against which the concrete is poured, the uprights which brace the panels, and alignment strips interconnecting the lower ends of the uprights and the upper ends of the uprights to hold such uprights in vertical position and to maintain the uprights in a row in proper alignment.

2

In Figure 1 a typical form footing and upright portions are shown. Stringers 1 of a width corresponding to the depth of footing desired are placed on edge in parallel relationship spaced apart a distance equal to the desired width of the footing. These stringers are usually set in the bottom of a pit or trench because it is ordinarily desired to have the footing placed below the surface of the ground. The lower edges of these stringers should rest evenly on the ground because they support the entire wall form and must be level if the completed form is to be straight and true. The spacing between these stringers is established and maintained by cross cleats or battens 10, bridging between the upper edges of the stringers and nailed to them. Filler strips 11, equal in thickness to the thickness of the battens 10, may be nailed to the upper edges of the stringers 1, extending parallel to them and located between the cleats 10 if desired, but usually little concrete would leak through the space which would be left even if these filler strips were omitted.

Resting on the battens 10 are the lower edges of the form panels 2. While these panels may be metal or plastic sheets, it is preferred that they be of plywood $\frac{5}{8}$ or $\frac{3}{4}$ of an inch in thickness. A better wall finish is obtained, and these panels can be used a greater number of times if these panels are surfaced with a plastic finish which will deter moisture absorption. Such plywood panels usually are four feet in width, and consequently it is convenient to space apart the uprights 20 in two-foot increments, so that such an upright will span the joint between adjacent panels, and the central portion of the panel in each instance will be supported by another upright.

Before the panels 2 are actually set in place, the footing form is precisely straightened by sheet metal alignment strips 12 extending lengthwise along opposite sides of it. These strips preferably include narrow flanges 13 projecting upwardly from the edges of the strips nearer to the center of the form against which the lower edges of the form panels 2 may abut. These flanges are spaced apart a distance equal to the thickness of the wall plus the thickness of the two panel form sides.

When the footing forms have been completed, as shown in Figure 1, therefore, the superstructure may be set in place. The uprights 20 may have bodies composed of angle members arranged with adjacent flanges in parallel, spaced-apart relationship, and the other flanges in coplanar, oppositely extending relationship to form a structure of generally T-shaped section. It is preferred that the bodies of the uprights be adjustable in effective length, and consequently the bodies may incorporate an additional pair of angle members 22 arranged in lengthwise overlapping relationship with the angle members 21. The angle members of these two pairs are apertured to receive connecting bolts 23 at spaced locations which will secure the pairs of angles together with portions of varying length overlapping, depending upon the overall length of upright required for the particular job.

At opposite ends of the upright are a foot 24 and a head 25 pivoted to the upright ends, and also of T-shaped cross section. Each foot is secured in the operative position shown in Figure 1 by a brace member 26, and the head member is similarly supported by a brace member 27.

A row of these uprights is first installed along one side of the footing form, and their upper ends are interconnected by upper alignment strips 3, which are the same as the lower alignment strips 12. The outer rows of the hole groups 14 are aligned with the rows of holes in the upright heads 25, and double-headed nails 30 are inserted through registering holes to effect such interconnection. Double-headed nails 16 are also driven

through holes in the foot of each upright and into strips 11, and perhaps stringers 1, to anchor the feet of the upright against movement in any horizontal direction and twisting. The row of uprights will thus be supported in reasonably stable fashion.

If the wall is unusually high or thick, additional bracing of the uprights may be desirable. This may be effected by interposing angle member spacers 31, particularly at the bottom, and, if desired, also at the top of the wall. The ends of these horizontal spacer members may be secured to the uprights by the bolts interconnecting the bodies and foot braces of the uprights, or they may be secured to the bolts 23 interconnecting the body angles 21 and 22 of the uprights. Additional horizontal bracing may be afforded by walers 32, also preferably of angle shape, which may extend along the central portion of the form and span a considerable number of the uprights. Such walers may be supported by form ties, as will be explained hereafter.

When one row of uprights has been placed and interconnected as described, the form wall panels 2 for the corresponding side may be stood edgewise on the battens 10 abutting the uprights. Assuming that each of the form wall panels is four feet wide and the uprights are spaced apart two feet, the opposite edges of the panels will have in them semicircular notches 4 which in the central portion of the panel may be spaced apart approximately twenty-four inches with the top and bottom notches about six inches from the upper and lower edges, assuming that the panels are eight feet long. At corresponding locations along the center of each panel are holes 40. When the panels are set on the battens 10 in edge-abutting relationship, the notches 4 in adjacent edges of adjacent panels will match to form complete holes corresponding to holes 40. The panels will be located so that the notches 4 and the holes 40 are in registry with the spaces between the body channels of the uprights, as shown in Figures 1 and 2.

As each panel is set in place it is anchored to an upright by form ties 41, each having a flattened portion 42 near one end and a head 43 upset on such form tie end smaller than a hole in a form wall panel, through which hole such head is passed. Between the flattened portion and the head is disposed a washer 44 for engagement with the inner side of the panel 2 around the hole 40, as shown in Figures 3 and 5. An expansible tensioning block engaged with the tie wire head 43 will draw the washer 44 into firm engagement with the form wall panel. As seen in Figures 3 and 5, the washer is of cupped resilient structure so that as the tie is tightened the washer will yield somewhat and press the panel firmly against the upright without digging into the panel and marring it.

The tensioning block, shown particularly in Figures 3 to 8, includes a bent sheet metal body 45 of generally channel shape, including a web of a width greater than the spacing between the body angles 22 of an upright shown in Figure 8, and having lugs 46 at opposite ends of the web bent from its plane in the direction opposite that in which the body flanges project. Between the flanges of the body is received a hinged tie wire engaging channel member 47, the flanges of which fit between the flanges of the body 45. Pivot pin 48, swingably interconnects the body member and the tie-engaging member, and the head 43 of the tie is passed through the larger portion of the keyhole slot 49 in the tie-engaging member and a similar slot in the web of body 45, and the tensioning block is then slid downward to engage the tie in the narrow portion of such slot.

In each side of the body 45 a group of holes 50 is provided in the body flange in staggered relationship, so that they will be spaced closely in a direction transversely of the web of the block body. The width of the flanges of tie-engaging member 47 preferably is considerably less than the width of the flanges of body 45. Also, the

flanges of tie-engaging member 47 may taper from the location of pivot 48 toward the swinging end of such member, as shown particularly in Figures 4 and 5. When the tie engaging member is swung from the position of Figure 4 to that of Figure 5, therefore, such as by engagement of a prying tool 51 between the web of the body 45 and the web of the swinging end of tie-engaging member 47, the edges of the tie-engaging member flanges will intersect the groups of holes 50. A double-headed nail may then be inserted through registering holes of the groups 50 in the opposite flanges of the body 45 close to the swinging member flanges, so that such flanges will engage the nail designated as 52 in Figure 8, for example. In Figure 5 the nail is shown inserted in different holes of the hole groups. Such nail serves the double purpose of retaining the member 47 swung away from body 45 in tie-tensioning position and prevents the tie dropping sufficiently to enable its head to move into registry with hole 49, thus locking the tie and the tensioning block together.

Where a waler 32 as shown in Figure 1, is employed, it can be anchored in place by the form ties extending through the holes and notches of the form panels midway between top and bottom of the form. This waler will have in it holes 32' of a size to receive through them the heads 43 of form ties 41, as shown in Figure 3. The waler will first be hung on tie ends inserted through such holes. Tensioning blocks of the type described above may then be engaged with the projecting tie ends and will be tensioned in the same manner as described. The double-headed nail 52 will fit in holes of the groups 50 somewhat closer to the web of body 45 than it would without the waler 32, because of the thickness of the waler angle stock and the spacing of the web of body 45 from the angle member flange effected by the tabs 46.

It will be evident that by following the procedure described all the panels 2 and the uprights constituting one side of a wall form may be assembled with the form ties 41 in place before any components of the other form wall are set up. The next step, then, will be to set the panels 2 for the other form wall in place. The holes 40 and notches 4 of these panels will be fitted over the heads on unanchored ends of the form ties, and the panels moved toward the form wall already set up until the panels engage the tie washers 44 and they in turn engage the flattened portions 42 adjacent to the free ends of the ties. Next the uprights will be placed in position standing on the alignment strips 12, and the tensioning blocks may be fitted loosely on the tie ends in engagement with the bodies of the uprights.

When the panels and uprights for the second form walls have thus been loosely assembled, the feet of the uprights may be secured in place in the same manner as shown in Figure 1 by double-headed nails 16, and the upper alignment strips 3 may be placed on the heads of the second row of uprights and secured in place by double-headed nails 16. If longitudinal stiffening members 31 are used, they will now be inserted along the second wall of the form, and a waler 32 may be hung on the ties along the central portion of the second wall. Next the tensioning blocks will be expanded to tighten the form ties, and such operation will complete the erection of the wall form for a single story wall.

Concrete will be poured into such a form in the usual way and allowed to set. To remove the forms after the concrete has set, the tie-engaging member of each tensioning block is pried outward enough to enable nail 52 to be withdrawn for collapsing the block. These tensioning blocks are then removed, and the upper alignment plates 3 lifted off the heads of the uprights. The walers and spacers 31 are next taken off, enabling the individual uprights to be removed by pulling double-headed nails 16 and sliding the uprights off the ends of the form ties. As soon as the uprights are removed, the

5

lower alignment strips 12 may be unfastened and taken off. The panels 2 are thus freed to be slipped off over the tie wire ends because holes 40 are larger than their heads 43. The footing forms may or may not be removed, as desired, and the ends of the form ties 41 which were anchored in the forms may be broken off slightly behind the outer surface of the wall at the flattened portions 42.

While the concrete form described above has for the most part utilized framework components of metal, it is entirely possible to incorporate the principles of my invention in a concrete form employing nearly all wood parts.

It will be appreciated that the general technique of form assembly utilizing components principally of wood is very similar to that described in connection with the form structure utilizing metal aligning strips and uprights.

I claim as my invention:

1. In a concrete form incorporating an upright and a wall engaging the upright, the combination of a stiff form tie extending through the wall substantially perpendicular thereto, and a tie-tensioning block engageable with an upright engaged by such wall and comprising two members including generally planar plate portions disposed generally parallel to the wall and substantially perpendicular to said form tie, the plate portion of said member farther from the wall being apertured to receive said form tie extending therethrough, said form tie end having means engageable with the edges of said aperture to prevent passage of the end of said form tie through said aperture, pivot means interconnecting corresponding ends of said tie-tensioning block members and guiding said members for swinging relatively from contracted relationship into expanded tie-tensioning relationship, and means interengaged between said members and operable to hold said members in such expanded relationship in opposition to a block-contracting force exerted thereon by said tie.

2. In a concrete form incorporating an upright and a wall panel engaging the upright, the combination of a

6

form tie carrying a washer engageable with a wall panel, and a tie-tensioning block engageable with an upright engaged by such a wall panel and including two channel members disposed with their flanges interfitting and apertured to receive an end of said form tie therethrough, pivot means interconnecting corresponding ends of said channel members and guiding said channel members for swinging relatively from contracted relationship into expanded tie-tensioning relationship, and means interengaged between the flanges of said channel members and operable to hold said channel members in such expanded relationship in opposition to a block-contracting force exerted thereon by the tie for securing the wall panel and the upright together.

References Cited in the file of this patent

UNITED STATES PATENTS

140,943	Moseley	July 15, 1873
986,565	Hedrich	Mar. 14, 1911
1,119,734	Van Giesen	Dec. 1, 1914
1,525,217	Zollinger	Feb. 3, 1925
1,552,885	Seat	Sept. 8, 1925
1,598,131	Ham	Aug. 31, 1926
1,622,072	Watson	Mar. 22, 1927
1,663,866	Snapp	Mar. 27, 1928
1,747,036	Sullivan	Feb. 11, 1930
1,970,547	Anderson	Aug. 21, 1934
2,020,912	Schenk	Nov. 12, 1935
2,095,714	Pinaud et al.	Oct. 12, 1937
2,312,983	Summers	Mar. 2, 1943
2,396,174	Hawes	Mar. 5, 1946
2,442,292	Hart	May 25, 1948
2,449,031	Woodson	Sept. 7, 1948
2,478,994	White	Aug. 16, 1949
2,511,584	Hill	June 13, 1950
2,576,986	Windsor	Dec. 4, 1951
2,657,449	Hillberg	Nov. 3, 1953

FOREIGN PATENTS

93,184	Switzerland	Mar. 9, 1921
--------	-------------	--------------