

[72] Inventors **John M. Furr;**
Grady E. Dearman, P. O. Drawer 1348,
Laurel, Miss. 39440
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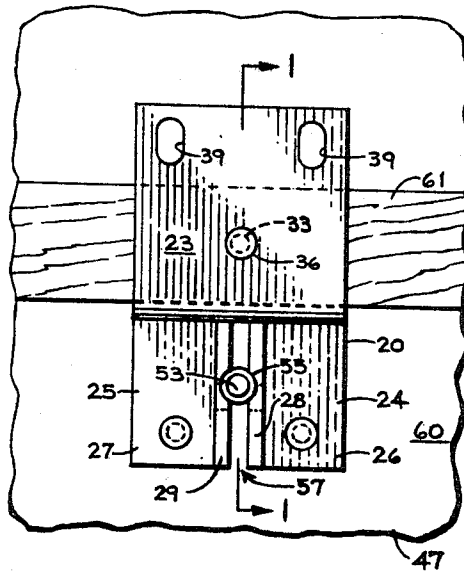
[54] **BRACKET AND TIE AND CONCRETE FORM SYSTEMS INCLUDING THE SAME**
15 Claims, 15 Drawing Figs.

Primary Examiner—J. Spencer Overholser
Assistant Examiner—R. L. Spicer, Jr
Attorney—L. S. Van Landingham, Jr

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 25/131
 [51] Int. Cl. E04g 17/06
 [50] Field of Search..... 249/21, 22,
 40—45, 219, 219W; 25/131H, T, 131CM

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ABSTRACT: An improved bracket is disclosed which is useful in constructing concrete forms from panels such as plywood sheets held in spaced relationship by ties. A round tie is also provided which may or may not be used with the bracket of the invention. Improved concrete forms are constructed from the bracket and/or tie of the invention.



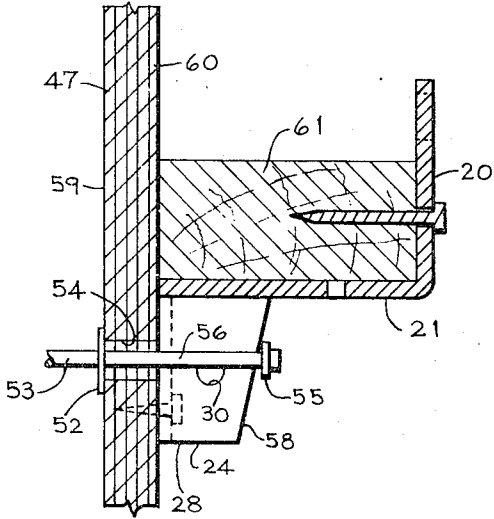


FIG. 2

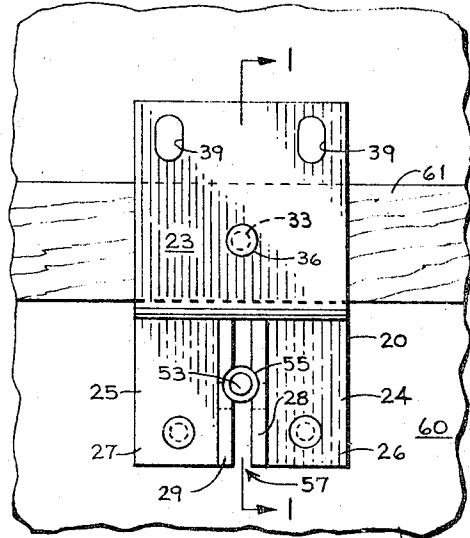


FIG. 1

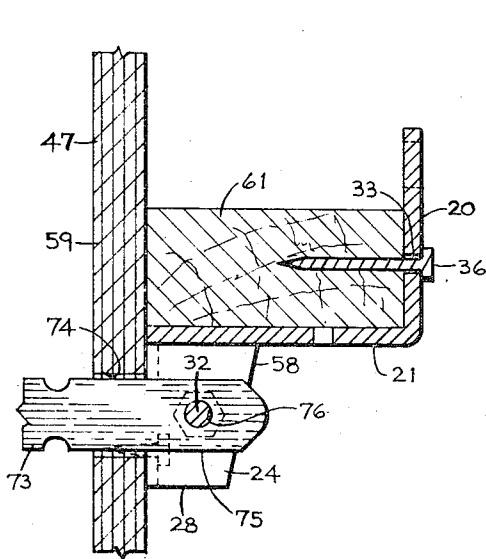


FIG. 4

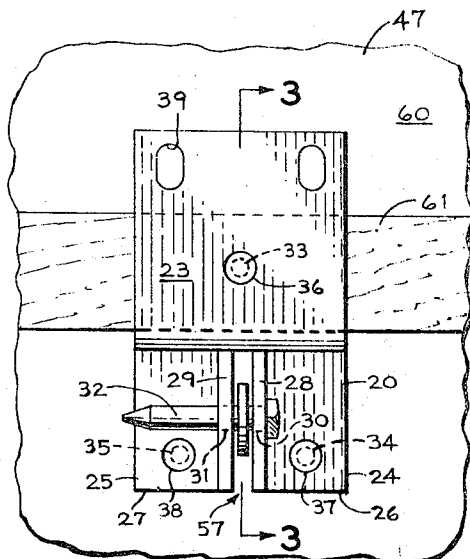


FIG. 3

INVENTORS
 JOHN M. FURR
 GRADY E. DEARMAN

BY

Allen Zandbergen, Jr.

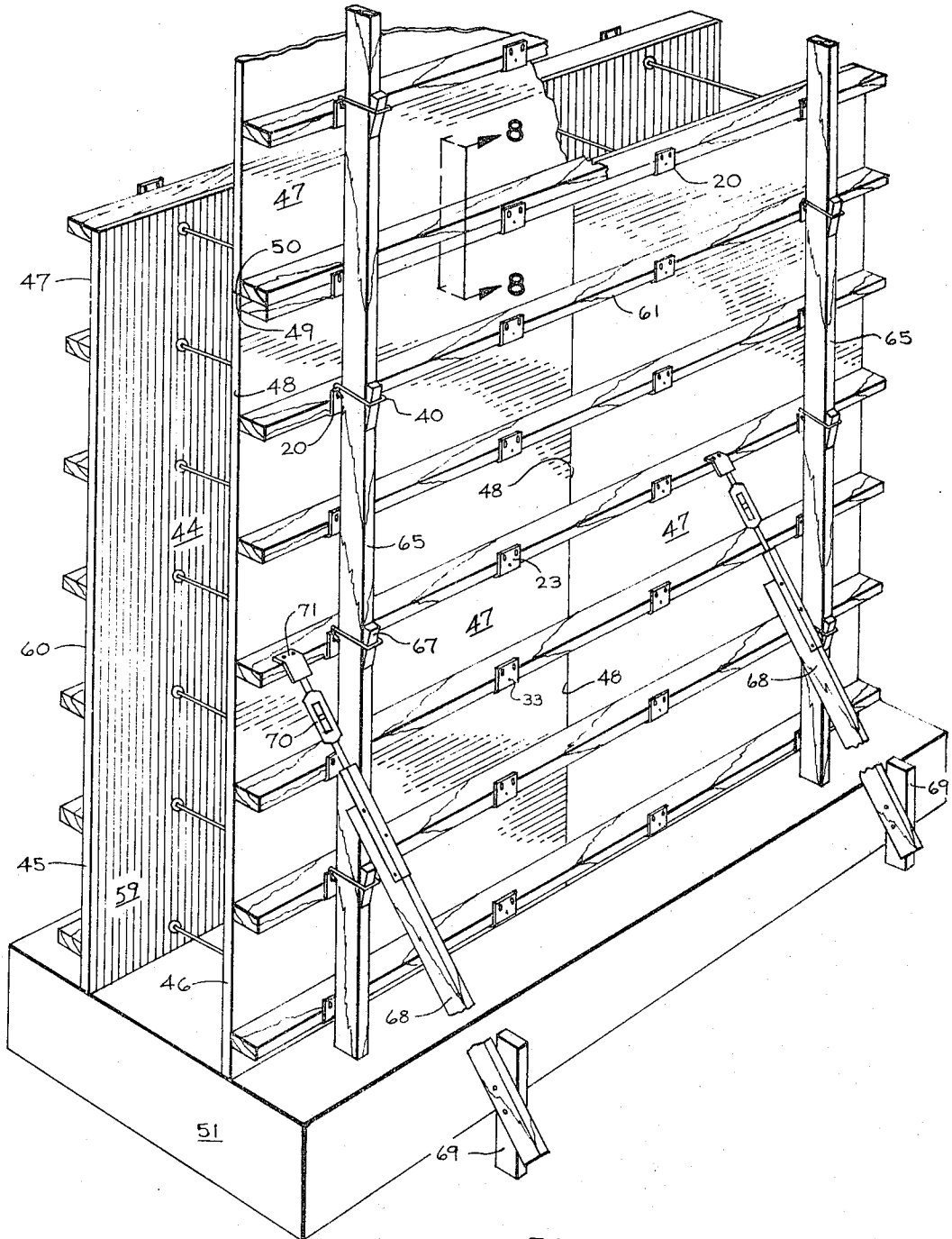


FIG. 7

INVENTORS
JOHN M. FURR
GRADY E. DEARMAN
BY

J. Allan Taylor, Jr.

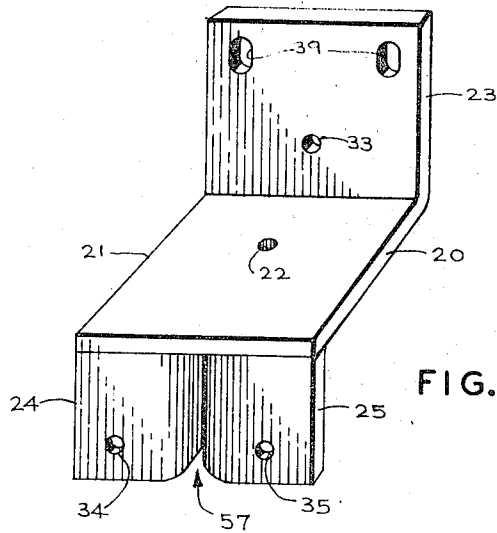


FIG. 12

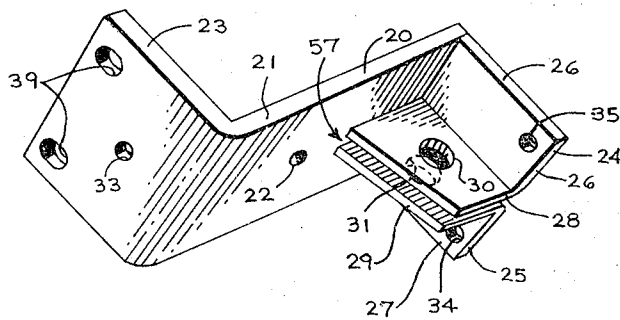


FIG. 13

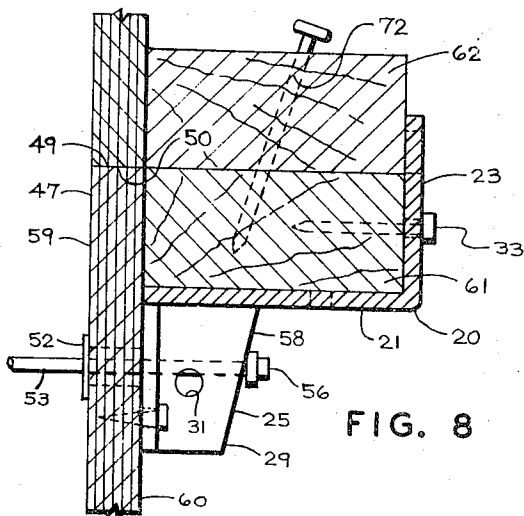


FIG. 8

INVENTORS
JOHN M. FURR
GRADY E. DEARMAN
BY

J. H. Landry

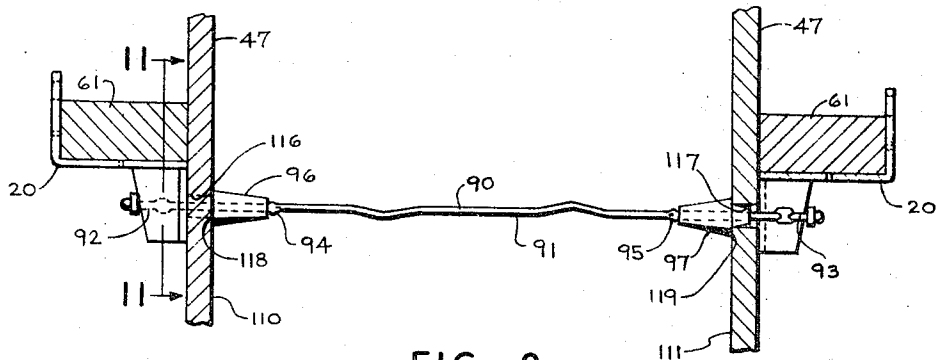


FIG. 9

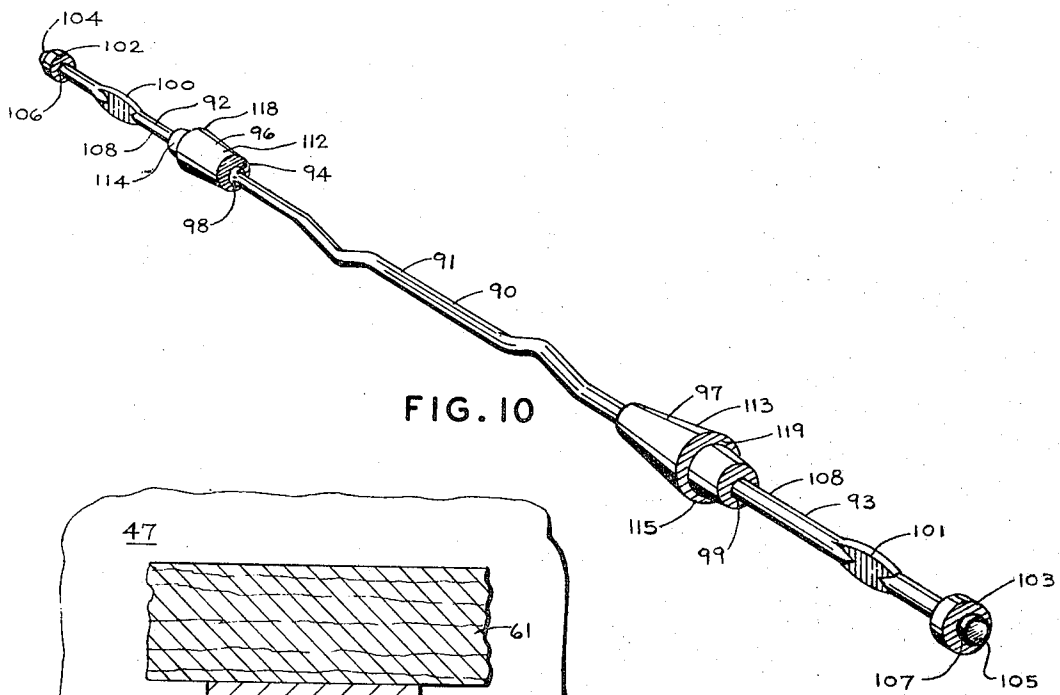


FIG. 10

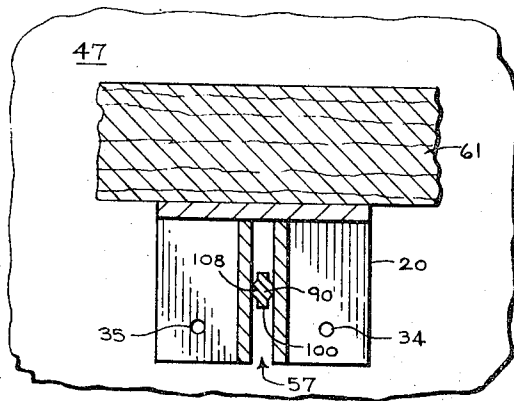


FIG. 11

INVENTORS
JOHN M. FURR
GRADY E. DEARMAN
BY

Alan T. Fisher, Jr.

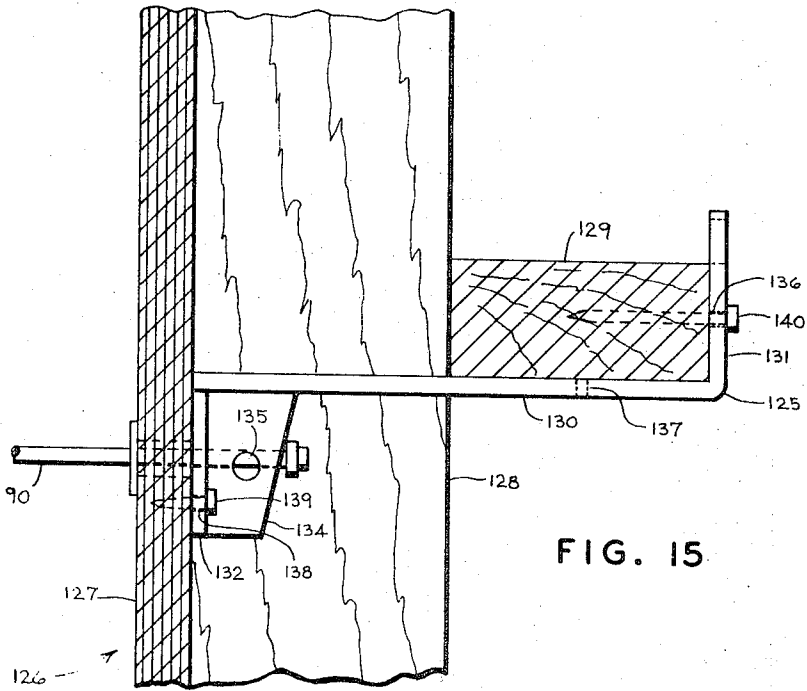


FIG. 15

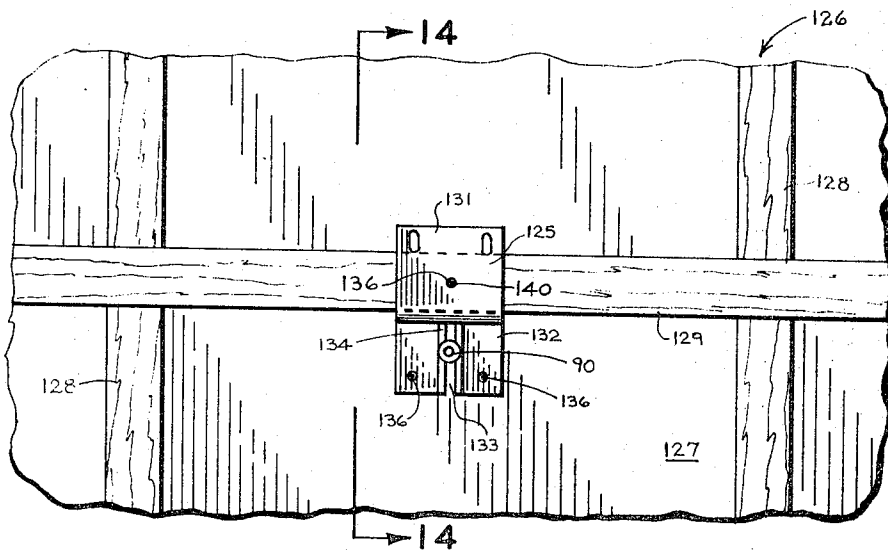


FIG. 14

INVENTORS
JOHN M. FURR
GRADY E. DEARMAN
BY

J. Alan Taylor, Jr.

BRACKET AND TIE AND CONCRETE FORM SYSTEMS INCLUDING THE SAME

This invention broadly relates to concrete form systems which are constructed from a series of abutting panels such as sheets of plywood maintained in spaced relationship by tie members which extend between and through the plywood sheets and are held on their outer ends by suitable hardware, and which have strengthening members positioned on the outer surfaces of the panels. In one of its more specific embodiments, the invention is concerned with an improved bracket for placing on the outside surfaces of the panels for the purpose of retaining the tie ends and strengthening members. The invention is also concerned with an improved tie for use in concrete form systems which may be used with or without the improved bracket. The invention further provides a novel concrete form system which utilizes the bracket and/or tie of the invention.

There are a number of important factors which must be taken into consideration in developing an efficient low-cost form system for use in pouring concrete walls and the like. For instance, the concrete form should be capable of being easily constructed from readily available materials, form components should be capable of being readily stripped from the completed concrete wall, and the major components should be reusable in constructing additional forms to lower costs. One type of concrete form which is in widespread use utilizes plywood to form spaced walls which are made up of a series of abutting, aligned plywood sheets. The plywood sheets must be retained in spaced relationship, and this is usually accomplished by providing ties which have spacers thereon running between the sheets in adjacent walls. The outer surfaces of the plywood sheets are provided with hardware to hold the ends of the ties which extend therethrough, and walers or studs for the purpose of imparting rigidity and strength to the sheets. Additionally, a strongback and braces may be provided for further strengthening, aligning and truing the wall, and maintaining it true during the pouring of the concrete.

A wide variety of hardware has been proposed heretofore for use in mounting and retaining the tie ends and the strengthening and aligning members such as studs, walers, strongbacks and braces on the outer surfaces of the plywood. Also, a wide variety of tie members have been provided for use in maintaining the adjacent plywood walls in a desired spaced relationship. However, the hardware and ties which have been available heretofore have not been entirely satisfactory due to a number of disadvantages and deficiencies such as high costs, difficult or slow assembly of the form from plywood panels, difficulty in stripping the form after the concrete wall has been poured, inability to reuse the components of the form, or inability to use the hardware for a plurality of purposes such as to simultaneously hold the tie ends and receive a strengthening or aligning member such as a stud and/or waler, a strongback, and braces. Additionally, the hardware available heretofore generally has not been capable of utilizing different thicknesses of plywood panels with ties of one length, or both round and flat ties. Thus, the present invention provides vastly improved hardware for constructing concrete forms of the aforementioned type.

It is an object of the present invention to provide an improved bracket for use in constructing concrete form systems from panels.

It is a further object to provide an improved round tie for use in constructing a concrete form system from panels.

It is still a further object to provide an improved form system which is especially useful in constructing concrete walls using the improved bracket and/or round tie of the invention.

Still other objects and advantages of the invention will be apparent to those skilled in the art upon reference to the following detailed description and the illustrative drawings, wherein:

FIG. 1 is a view in elevation of the improved bracket of the invention in place on a plywood panel illustrating use thereof with a prior art round tie;

FIG. 2 is a cross-sectional view taken along the line 1-1 of FIG. 1;

FIG. 3 is a view in elevation similar to FIG. 1, but illustrating use of the bracket with a prior art flat tie;

FIG. 4 is a cross-sectional view taken along the line 3-3 of FIG. 3;

FIG. 5 is a fragmentary perspective view of a concrete form using a whaler system constructed from components including the improved bracket and prior art round ties, and further illustrating the manner in which the bracket is placed on the ends of the ties;

FIG. 6 is a fragmentary perspective view of a concrete wall form using a stud system and flat ties;

FIG. 7 is a perspective view of a concrete wall form using round ties and a whaler system;

FIG. 8 is a fragmentary cross-sectional view taken along the line 8-8 of FIG. 7;

FIG. 9 is a fragmentary view in elevation, partially in cross section, of a concrete wall form including the bracket and tie of the invention;

FIG. 10 is a perspective view of the improved round tie of the invention;

FIG. 11 is a cross-sectional view taken along the line 11-11 of FIG. 9;

FIG. 12 is a perspective view of the top of the bracket of the invention;

FIG. 13 is a perspective view of the bottom of the bracket of the invention;

FIG. 14 is a fragmentary view in elevation illustrating the use of a variant of the bracket of the invention in a concrete form constructed from builtup panels; and

FIG. 15 is a cross-sectional view taken along the line 14-14 of FIG. 14.

Referring now to the drawings, the bracket 20 of the invention includes a flat medial portion 21 which is provided with an opening 22 for a nail or other suitable fastening device. The medial portion 21 terminates at one end in a flat portion 23 which extends outward to form approximately a 90° angle therewith, and at the other end in spaced members 24 and 25 which likewise extend outward therefrom. The members 24 and 25 include flat portions 26 and 27, respectively, which extend outward from medial portion 21 and form approximately a 90° angle therewith. As is best seen in FIGS. 12 and 13, the portion 23 and the portions 26 and 27 extend outward from opposite surfaces of medial portion 21 and lie in approximately parallel planes. The members 24 and 25 also include flat portions 28 and 29, respectively, which extend outward from medial portion 21 and form approximately a 90° angle therewith, and also approximately as 90° angle with portions 24 and 25, respectively. As is best seen in FIGS. 12 and 13, the portions 28 and 29 lie in spaced approximately parallel planes which form approximately a 90° angle with the plane passing through portions 26 and 27 respectively. The portions 28 and 29 are provided with openings 30 and 31 which are aligned to receive a pin 32 when the bracket is in use with a flat tie, as is best seen in FIGS. 3, 4 and 6. The members 23, 26 and 27 are provided with nail holes 33, 34 and 35 which receive nails 36, 37 and 38, respectively, as is best seen in FIGS. 1-4, 6 and 8. The member 23 is also provided with a pair of spaced elongated openings 39 for receiving the ends of hook 40 as is best seen in FIGS. 5-8.

FIGS. 1 through 8 of the drawings illustrate the manner in which the bracket 20 of the invention may be used in constructing a form for use in pouring a concrete wall using prior art round or flat ties. Referring now to FIGS. 1, 2, 5, 7 and 8, which illustrate the use of bracket 20 together with prior art round ties, it may be seen that the spaced walls 45 and 46 are formed from a series of plywood panels 47 which are abutted at their side edges 48 and their top and bottom edges 49 and 50. The walls 45 and 46 rest upon footing 51 and are maintained in spaced relationship by means of spacers 52 on round ties 53 to form a cavity 44 therebetween to receive the concrete mix. As is best seen in FIGS. 2, 5 and 8, the spacers 52 have a diameter greater than the openings 54 in plywood

panels 47, whereas the diameters of tie 53 and the washers 55 which are mounted at each end thereof have diameters sufficiently small to pass through openings 54. End portions 56 of ties 53 extend outward from the plywood walls 45 and 46 and through the spaces 57 formed between spaced members 28 and 29. As is best seen in FIGS. 1, 2 and 8, the washers 55 have a diameter greater than the width of spacings 57, and the length of ends 56 is such so as to allow the angular surfaces 58 on portions 28 and 29 to urge the ends 56 outward, thereby bringing spacers 52 into engagement with the interior surfaces 59 of plywood walls 45 and 46. Inasmuch as the surfaces 58 slope outward and upward from the exterior surfaces 60 of plywood panels 47, this allows adjustments to be made in instances where plywood of varying thickness is used. For instance, it is possible to use five-eighths inch or three-fourths inch plywood and only one length of round tie with the bracket 20 due to the adjustment provided by the angular surfaces 58. Often it is desired to use thinner and less costly plywood panels on the second tier of high walls than are used on the bottom tier, and this is possible without changing the length of the ties 53 when using the bracket 20 of the invention.

As is best seen in FIG. 5, the brackets 20 may be easily mounted on the plywood panels 47 by lowering from a position above the ends 56 of ties 53 downward thereover, with the ends 56 being inserted into spaces 57, and then pushed downward until the washers 55 engage the surfaces 58 and the spacers 52 engage the interior surface 59 of the plywood panels. The amount of downward movement will be dependent upon the thickness of the plywood and the length of ends 56 when measured from spacers 52, as will be apparent from FIG. 2. Once the brackets 20 are properly set in place in horizontally and vertically extending rows as shown in FIG. 7, then nails 37 and 38 may be inserted in nail holes 34 and 35 in portions 28 and 29, respectively, and driven into the plywood panels 47 as is best seen in FIGS. 2, 4 and 8. The nails 37 and 38 are not always necessary for retaining the brackets 20 in place. The whalers 61, which may be wooden 2 x 4's, are then placed on the medial portions 21 of the horizontally extending rows of brackets 20. Since the brackets 20 are preferably positioned on plywood panels 47 whereby they fall within a plurality of vertical and horizontal rows, this allows the whalers to extend horizontally across the panel members 47, to thereby strengthen the panels 47 at a plurality of heights as the wall rises. Nails 36 may be inserted in openings 33 and driven into the whalers to thereby retain them in position when this is desired.

Inasmuch as the portions 23 of brackets 20 are flat and form approximately a 90° angle with medial portion 21, and since the brackets 20 are also arranged in vertical rows extending upward along the panels 47, it is possible to attach upright strongbacks 65 to brackets 20 by means of hooks 40 having spaced end portions 66 which are inserted through openings 39. Wedges 67 are then inserted between the hooks 40 and the strongbacks 65 and tightened to thereby urge the strongbacks 65 against the back side of flat portions 23, thereby providing both vertical and horizontal support for panels 47. The walls 45 and 46 are maintained in an upright or true position by means of braces 68, which are nailed to stakes 69 of their lower ends and provided with screw-type adjusters 70 on their upper ends. The adjusters 70 are provided with plates 71 which are nailed to whalers 61. The adjusters 70 allow adjustments in length to be made as necessary to assure that the walls 45 and 46 are maintained true at all times.

One common length and width of plywood panels is 4 foot x 8 foot and, in instances where it is desired to construct a form for a wall having a height greater than 8 foot, this may be readily accomplished as illustrated in FIGS. 7 and 8. As is best seen in FIG. 8, a horizontal row of brackets 20 extend along the walls 45 and 46 at a distance sufficiently below the top edges 49 of panels 47 to assure that the top surfaces of whalers 61 will coincide therewith. The lower edges 50 of the panels 47 are placed on top of the upper edges 49, and second

whalers 62 are placed on top of the first whalers 61, to thereby support both the lower and upper edges 49 and 50 at the resulting joint. The whalers 61 and 62 are maintained in position by means of nails 72, if desired. As may be seen in FIG. 8, the width of the medial portions 21 closely approximates the width of the whalers 61 and 62, and the height of portions 23 is approximately 1½ times the thickness of whalers 61, thereby allowing whalers 62 to be placed thereon and held in position by a minimum number of nails 72.

The use of bracket 20 with a prior art flat tie and with whalers 61 arranged as illustrated in FIG. 7 is best seen in FIGS. 3 and 4. For instance, the flat tie 73 is merely substituted for the round tie 53 which is illustrated in FIGS. 1, 2, 5, 7 and 8, and the other elements remain the same. As is best seen in FIGS. 3 and 4, the flat ties 73 are inserted through slot-like openings 74 in plywood panels 47 and extend past exterior plywood surface 60 a distance sufficient to provide end portions 75 which are inserted into spaces 57 of brackets 20. The openings 76 in ends 75 are in alignment with openings 30 and 31 whereby pins 32 may be inserted therethrough, as is best seen in FIG. 3, for the purpose of retaining tie 73 securely in place.

The bracket 20 also may be used with the flat tie 73 and studs 77 as illustrated in FIG. 6. Referring now to FIG. 6, the walls 78 and 79 are formed of plywood panels 47 as previously discussed for FIG. 7. The panels 47 are provided with openings 74 to receive the flat ties 73, which extend therethrough as discussed for FIGS. 3 and 4 to provide tie ends 75 which are inserted into spaces 57 of brackets 20. The openings 76 in tie end 75 are in alignment with the openings 30 and 31 whereby the pins 32 may be inserted therethrough for retaining the same. It may be noted that the wooden 2 x 4 studs 77 are spaced at intervals along the plywood panels 47, and that the brackets 20 are rotated approximately 90° from the positions used when the 2 x 4's run horizontally as whalers as in FIG. 7. The brackets 20 are positioned with the medial portion 21 being fitted against the width of studs 77, and if desired with nails 37 and 38 being inserted into openings 34 and 35, respectively, and driven into the plywood panels 47. If desired, nails 41 may be inserted into openings 22 in portions 21 and driven into studs 77 to securely hold the brackets 20 in place. A whaler 82 may be positioned across the horizontal rows of brackets 20 and is attached thereto by means of hooks 40 and wedges 67 in much the same manner as described previously for strongback 65. For instance, the ends 66 of hooks 40 are inserted into openings 39, the strongback is passed through the hooks 40, and the wedges 67 are driven into position until they are tight. It is understood that the strongback 82 extends horizontally across a plurality of the brackets 20 and is attached to each in the manner illustrated in FIG. 6. The brackets 20 may be used interchangeably for studs and whalers without modification with the exception of substituting a flat tie for a round tie and rotating the brackets 20 about 90° on panels 47.

The present invention also provides an improved round tie which, while it may be used with other types of tie-retaining means, is especially useful in combination with the bracket 20 of the present invention. Referring now to FIGS. 9, 10 and 11, the tie 90 has a centrally located portion 91 which is arranged between ends 92 and 93. The ends 92 and 93 are joined to the central portion 91 at upset beads 94 and 95, which serve as stops for double cones 96 and 97, respectively, which are provided with longitudinally extending bores 98 and 99. The ends 92 and 93 are also provided with flat portions 100 and 101, washers 102 and 103, and enlargements 104 and 105, respectively. The bores 98 and 99 in double cones 96 and 97 have diameters smaller than upset beads 94 and 95 and the width of flat portions 100 and 101, respectively, but sufficiently large to easily receive the wire 108 of ends 92 and 93 whereby they are movable between upset beads 94 and 95 and flat portions 100 and 101, respectively. Similarly, the washers 102 and 103 have openings 106 and 107 which are sufficiently large to easily receive wire 108 of ends 92 and 95, but insufficiently large

to receive flat portions 100 and 101 and enlargements 104 and 105, thereby allowing washers 102 and 103 to be slideably mounted for movement between flat portions 100 and 101 and enlargements 104 and 105, respectively.

As is best seen in FIG. 11, the flat portions 100 and 101 have a width substantially greater than the spacing 57 in bracket 20, and the wire 108 has a diameter closely approximating that of the width of space 57. Upon removing the whaler 61, the brackets 20 may be loosened and rotated to the right or left to thereby apply sufficient torque to break the tie 90 at the upset beads 94 and 95. As will be recognized by those skilled in the art, the upset beads 94 and 95 are especially designed so as to provide sufficient tensile strength in the form, but whereby they are sufficiently weak when torque is applied thereto to allow them to break. The tie 90 may be broken at the upset beads 94 and 95 and the central portion 91 remains in the completed concrete wall. The ends 92 and 93, including cones 96 and 97, are stripped along with the plywood panels 47.

Upon reference to FIG. 9, the tie 90 is shown positioned between walls 110 and 111 which are formed from plywood panels 47 in the manner previously discussed in connection with FIG. 7. The brackets 20 and whalers 61 are also attached to the panels 47 in the same manner as discussed above in connection with FIG. 7, and the ends 92 and 93 extend through spaces 57 in brackets 20 as discussed above in connection with FIG. 11. Inasmuch as the concrete is allowed to set before the ends 92 and 93 are removed, it is apparent that the double cones 96 and 97 perform several very important functions. The large cone portions 112 and 113 taper to a progressively smaller cross section with increasing depth in the concrete and they are readily removed therefrom after it sets. The smaller cone portions 114 and 115 are mounted in openings 116 and 117, respectively, in a close-fitting relationship and aid in supporting the tie 90 and the bracket 20 when constructing the form. The shoulders 118 and 119 serve as stops as the diameters of openings 116 and 117 are smaller than the maximum diameter of cones 96 and 97, respectively. It is therefore possible to rotate the wire 108 of ends 92 and 93 in the bores 98 and 99 of cones 96 and 97 within the hardened concrete and the openings 116 and 117 at the time of breaking the beads 94 and 95 and stripping the form.

While substantially any prior art may be used with the bracket 20, the round tie 90 of the invention has many important advantages. For instance, the brackets 20 may be rapidly assembled on the plywood panels 47, and in many instances it is not necessary to use the nails 37 and 38 in openings 34 and 35 since the cone portions 114 and 115 aid in retaining the brackets in their proper positions, and especially when the whalers 61 are in place so as to prevent rotation. The forms also may be readily stripped. Upon removal of the whaler 61, the brackets 20 may be loosened slightly and rotated so as to snap the ties 90 at the upset beads 94 and 95, thereby allowing the ends 92 and 93, the cones 96 and 97 and the plywood panels 47 to be pulled outward and stripped from the partially cured concrete wall in a minimum period of time. The brackets 20 and plywood panels also may be stripped first and the ties 90 then snapped at beads 94 and 95 following prior art practices, but this requires more time.

The brackets 20 are unique in that it is possible to use both flat and round ties with the one bracket. Additionally, in instances where the flat ties are employed, it is possible to use the brackets for both stud and whaler systems. In instances where the round tie is employed, different thicknesses of plywood may be employed with the same tie length, and this is especially important in instances where walls of substantial height are to be poured as the use of different thicknesses of plywood results in a saving in forming costs. The bracket 20 also allows a shorter tie to be used which is less costly as the ends need extend only a short distance through the plywood panels. The short tie ends do not prevent a strongback from being positioned against the flat back sides of portions 23, thereby allowing the wall to be strengthened by directly

abutting the strongback against the brackets. The brackets 20 also may be used as a tie holder without the need for either a whaler or stud. In instances where some of the brackets 20 are used as a tie holder, the concrete form may be constructed at a reduced cost as only a sufficient number of whalers need be provided for proper alignment. This also allows the ties to be positioned at optimum spacings, and spacings may be selected which are not covered by the whaler.

While plywood panels are preferred, still other panel materials may be employed including metals such as steel and aluminum, and other types of wooden panels such as particle board, chipboard, etc. It is usually preferred that the brackets 20 be constructed of steel, but other suitable metals may be employed provided they have sufficient strength to withstand the stresses involved.

FIGS. 14 and 15 of the drawings illustrate a further embodiment of the bracket of the invention wherein a modified bracket 125 and the round tie 90 are used in constructing a form for a concrete wall 126, which may be similar to that illustrated in FIGS. 5, 6 and 7, from plywood panels 127 using a stud 128 and whaler 129 system which is constructed at the building site from prior art plywood as the panels 127 and commercially available 2 inches x 4 inches wooden timbers as the studs 128 and whalers 129. The brackets 125 are identical with brackets 20 with the exception of medial portion 130 being of a length to receive the studs 128 and the whalers 129, i.e., it is of a length approximately equal to the width of studs 128 and whalers 129. In the previously described embodiment of bracket 20, the medial portion 21 was of a length to receive only the whalers 61 or the studs 77 in a form system as shown in FIGS. 5-7, as distinguished from a site-built system as shown in FIGS. 14 and 15. The bracket 125 also includes an upwardly extending end portion 131 and a downwardly extending end portion 132. The portion 132 is provided with slot 133 which is of a size to receive the ends of tie 90, and spaced flangelike members 134 which are provided with aligned openings 135. The openings 136 in member 132, the openings 137 in member 130, and the openings 138 in member 132 correspond to similar openings in bracket 20. The nail 139 in opening 138 retains the bracket 125 in position on the panels 127, and the nail 140 in opening 136 retains the whaler or aligning member 129 in position. Spaced openings 141 are also provided which are similar to openings 39 in bracket 20.

The foregoing detailed description and the various FIGS. in the drawings are for purposes of illustration only, and are not intended as being limiting to the spirit or scope of the appended claims.

We claim:

1. A bracket useful in constructing concrete forms from spaced panel members having aligned openings formed therein for receiving the ends of tie members comprising a generally flat elongated medial portion having first and second ends, a first generally flat elongated portion extending upward from the first end of the medial portion, a second generally flat elongated portion extending downward from the second end of the medial portion, the said first and second flat elongated portions being formed integrally with the said medial portion, the said second flat elongated portion having an opening formed therein for receiving the end of a tie member which also has an opening formed therein, and spaced flangelike members positioned on opposite sides of the said opening in the second flat elongated portion and extending back toward the first end of the medial member, the said flangelike members having aligned openings formed therein which are alignable with the opening in the end of the tie member whereby an elongated retaining means may be passed therethrough for retaining the end of the tie.

2. The bracket of claim 1 wherein the first and second portions form substantially 90° angles with the said medial portion.

3. The bracket of claim 2 wherein the spaced flanges form substantially 90° angles with the said second portion.

4. The bracket of claim 3 wherein spaced flanges are formed integral with the bottom of the said medial portion whereby the flanges brace the said second and medial portions and prevent relative movement therebetween.

5. The bracket of claim 1 wherein the said second portion has at least one opening formed therein for receiving a fastening means for securing the bracket to at least one of said panel members.

6. The bracket of claim 5 wherein said first portion and medial portion have at least one opening formed therein for receiving a fastening means for securing said bracket to a member for strengthening said panel members.

7. The bracket of claim 1 wherein the said first portion has spaced openings formed therein for receiving a hooklike fastening means for attaching thereto a second member for aligning said panel members.

8. The bracket of claim 1 wherein the said medial portion is of a length to receive an elongated member for strengthening said panel members.

9. The bracket of claim 1 wherein the said medial portion is of a length to receive both an elongated member for strengthening said panel members and a second elongated member for aligning said panel members.

10. The bracket of claim 1 wherein the first and second portions form substantially 90° angles with the said medial portion, the spaced flanges form substantially 90° angles with the

said second portion, and the spaced flanges are formed integral with the bottom of the said medial portion whereby the flanges brace the said second and medial portions and prevent relative movement therebetween.

11. The bracket of claim 10 wherein the said second portion has at least one opening formed therein for receiving a fastening means for securing the bracket to at least one of said panel members.

12. The bracket of claim 11 wherein the said medial portion is of a length to receive an elongated member for strengthening said panel members.

13. The bracket of claim 12 wherein the said first portion and the said medial portion have at least one opening formed therein for receiving a fastening means for securing said bracket to the said member for strengthening said panel members.

14. The bracket of claim 13 wherein the said first portion has spaced openings formed therein for receiving a hooklike fastening means for attaching thereto a second member for strengthening and aligning said panel members.

15. The bracket of claim 14 wherein the said medial portion is of a length to receive both the said member for strengthening the panel members and the second member for aligning the said panels.

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