June 1, 1965 H. T. DUDLEY 3,186,677

WALL FORM FOR CONCRETE CONSTRUCTION

Filed Nov. 4, 1963 2 Sheets-Sheet 1

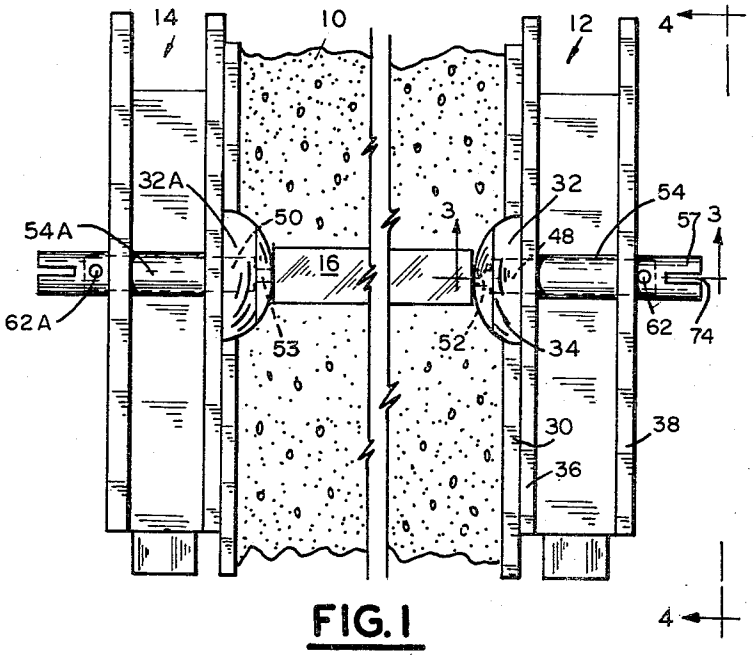


FIG. 1

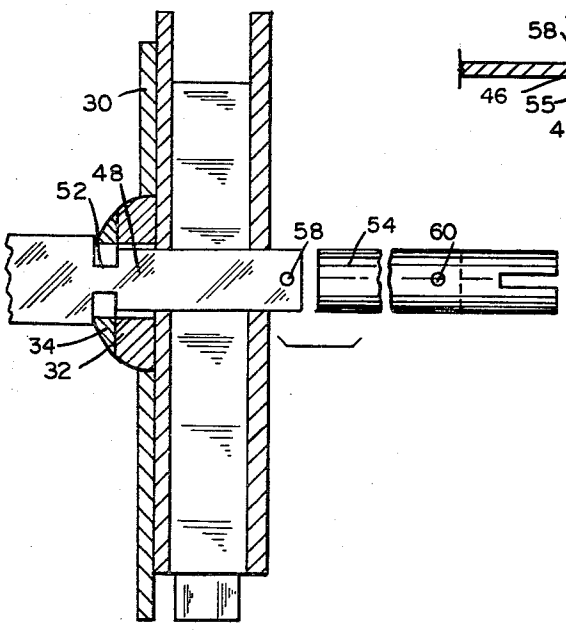


FIG. 2

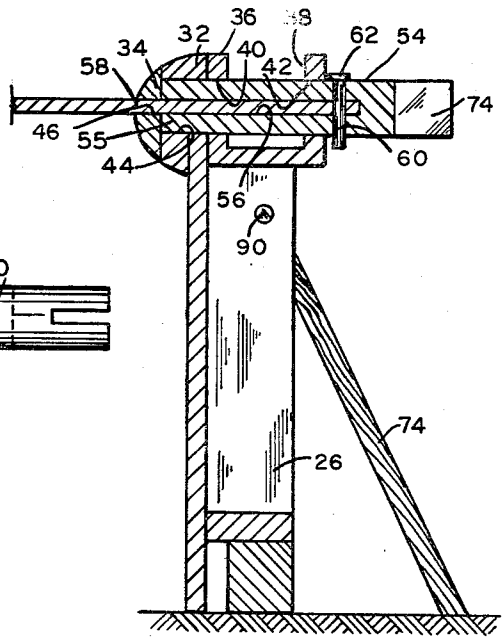


FIG. 3

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WALL FORM FOR CONCRETE CONSTRUCTION

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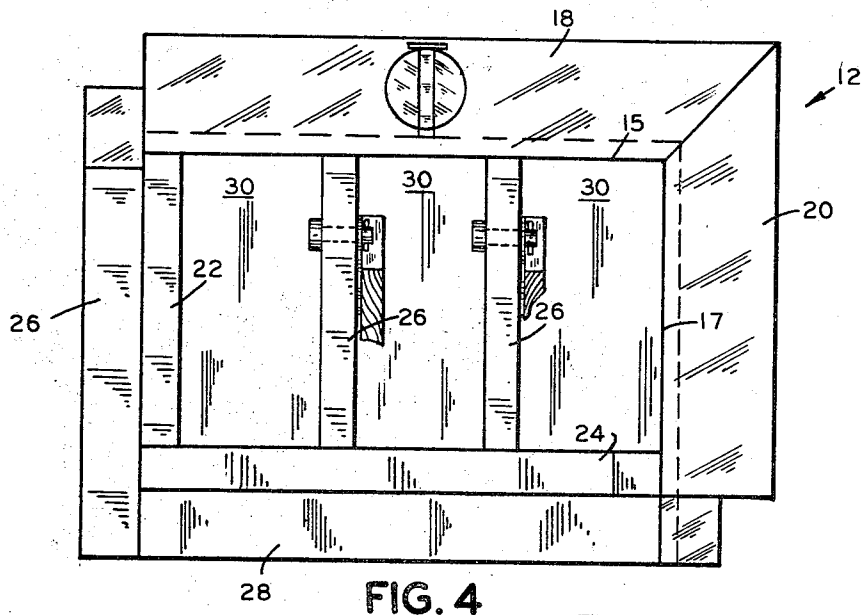


FIG. 4

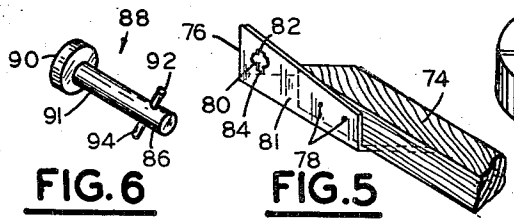


FIG. 6

FIG. 5

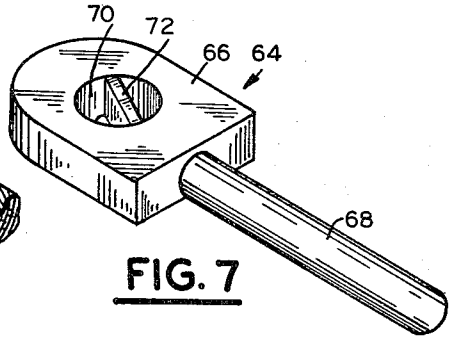


FIG. 7

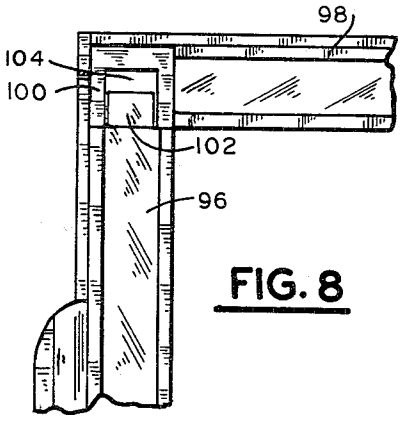


FIG. 8

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WALL FORM FOR CONCRETE CONSTRUCTION

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4 Claims. (Cl. 249—41)

This invention relates to an improved wall form for concrete construction. More particularly, this invention relates to improved forms for construction of concrete walls including improved wall ties for holding opposite walls of the forms together and improved lateral wall bracing means. This invention also relates to an improved tool for releasing the wall ties from the form walls after the concrete has been poured therebetween and become hardened or set up.

It has long been the practice in building concrete walls to use two spaced apart vertical wall forms between which concrete is poured and allowed to harden thereby to form the desired wall.

These wall forms are commonly made of wood and oftentimes are built at the location of the construction work and later torn apart after the concrete wall has been formed. Other wall forms in common use today are built in prefabricated sections that are connected together at the job site to form the desired wall form.

In the wall forms conventionally used today a multiplicity of wall ties extend between the wall forms located on each side of the concrete wall to connect them together and prevent bulging or breaking apart of the wall forms when the concrete is poured therebetween. Conventional wall ties in use today consist of a rod or ribbon of steel or other strong metal that extends through matching holes in the opposite wall forms and are retained therein by retainer pins extending through the wall tie, externally and adjacent to the two wall forms. These wall ties are usually spaced every two or three feet throughout the length and height of the wall forms.

After the wall is formed between the opposite wall forms and it is desired to remove the wall form it is first necessary to remove or otherwise release the wall ties from the wall forms. This is usually done by removing the outer retainer pins from the wall ties. Then the wall forms can be moved laterally or horizontally away from the side of the concrete wall until the forms are free of the exposed ends of the wall ties.

It has been found in removing the wall forms in the above described manner that the wall ties tend to bind in their respective holes or slits in the wall form thereby making it extremely difficult to remove the wall form.

Therefore, it is an object of this invention to provide a wall form for concrete construction that overcomes the disadvantages of prior known wall forms.

Another object of this invention is to provide a strong, durable metallic wall form for concrete construction that is made up in a plurality of prefabricated sections that can be easily connected together at the job site in the shape of the desired wall form.

Still another object of this invention is to provide an improved prefabricated wall form for concrete construction that can be easily and quickly assembled on the job site in the shape of the desired concrete wall and later disassembled after the wall is formed therebetween.

Still a further object of this invention is to provide an improved wall form for concrete construction and an improved wall tie for connecting opposite spaced apart form walls together during the pouring or construction of the concrete wall therebetween.

A further object of this invention is to provide an improved wall form for concrete construction including

an improved wall tie for holding opposite form walls in correctly spaced relation, the tie being easily released from the opposite form walls to permit removal of the form walls from the concrete wall at the completion of the construction job.

Another object of this invention is to provide a wall form for concrete construction including improved wall ties extending between opposite form walls, the exposed ends of the wall ties provided with a weak point to allow breaking of the exposed ends of the wall ties from the remainder of the ties thereby allowing easy removal of the wall forms from the constructed wall.

Still a further object of this invention is to provide a wrench for breaking the wall ties at their respective weak points thereby to release them from connection with the wall form to facilitate removal of the wall form from the concrete wall.

In constructing concrete walls or similar structures with the use of form walls, it has been found necessary to brace these forms against lateral or horizontal movement with respect to the concrete wall formed therebetween. It is very important that this lateral support be relatively strong because of the great weight of the concrete used in the wall construction and the resultant large lateral forces applied to the wall forms.

When using the more conventional wooden wall form this lateral bracing usually takes the form of a plurality of relatively large boards or timbers attached to the upper portion of the wall form inclining downwardly into contact with the ground. These timbers or boards are usually nailed in place on the wall form each time the form is to be used. When the form is to be removed from the finished concrete structure, the bracing elements are usually removed from the form. Obviously such an operation is very time consuming and troublesome.

Therefore, another object of this invention is to provide a wall form for concrete construction including improved lateral bracing therefor.

Yet another object of this invention is to provide improved lateral bracing elements for wall forms for concrete construction which are easily and quickly attached to the form walls prior to the pouring of concrete therebetween and are easily and quickly removed from the form walls prior to disassembling the form.

Further objects and advantages of this invention will be apparent from the following description and appended claims, reference being had to the accompanying drawings forming a part of this specification wherein like reference characters designate corresponding parts in the several views.

FIGURE 1 is a top elevational view of opposite form walls of the wall form of this invention, connected together by the wall tie and having a concrete wall located therebetween.

FIGURE 2 is a partially exploded cross-sectional elevational view of the improved form wall of this invention.

FIGURE 3 is a cross-sectional elevational view of one of the form walls of FIGURE 1 taken along line 3—3.

FIGURE 4 is an elevational view of the wall form of FIGURE 1 taken along line 4—4.

FIGURE 5 is an external view of the lateral bracing member for the wall form of this invention.

FIGURE 6 is an external view of the retainer pin used to attach the lateral bracing member to the wall form of this invention.

FIGURE 7 is a view of a wrench used to break the wall tie of this invention at its weak point prior to removal of the wall form from the finished wall.

FIGURE 8 is a top elevational view of one wall of the wall form of this invention used to make a corner in the finished wall.

GENERAL DESCRIPTION

The wall form of this invention consists in general of a reinforced form wall structure provided along two adjacent edges with grooves for receiving therein lip extensions provided on adjacent wall structures and provided along the two remaining adjacent edges with lip extensions to be received within corresponding grooves in adjacent wall structures. An improved wall tie for extending between opposite form wall structures to maintain them in properly spaced apart position is also provided. The wall tie is provided near each end thereof with a weak point that can be relatively easily sheared or broken by a wrench provided especially for that purpose to release the opposite form wall structures for removal from the completed concrete wall located between them.

SPECIFIC DESCRIPTION

Referring now to FIGURE 1 there is shown a concrete wall **10** positioned within the wall form of this invention.

The wall form of this invention consists of two form walls **12** and **14** tied together by a plurality of wall ties **16** made according to this invention.

Since form walls **12** and **14** are similarly constructed this description will be limited to form wall **12** only.

As can best be seen in FIGURE 4, form wall **12** is a relatively flat reinforced structure consisting of two channel members **18** and **20**, intersecting at right angles to form two adjacent edges of the structure, and two frame members **22** and **24**, intersecting at right angles to form the remaining two edges of the structure. Extending vertically between the upper channel member **18** and the bottom frame member **24** are several reinforcing members **26**. Extending substantially parallel to the plane of the flatlike wall form **12** and attached to the frame structures **22** and **24** are lip extensions **26** and **28**, respectively. Lips **26** and **28** are of such a size and shape that they will fit within the grooves of the channel members (similar to members **18** and **20**) of adjacent wall sections (not shown) to assist in connecting adjacent wall sections together to form an overall wall form for concrete wall construction.

Provided on the frontal side of the form wall, that is, the side next to the concrete wall to be formed thereby, is a flat, substantially smooth surfaced panel facing **30**. The back side of the form wall remains open. A wall tie receiver element **32** extends forwardly from attachment to the front face of the form wall **12** for receiving one end portion of a wall tie **16** to be described hereinafter. Receiving element **32** is provided on its forwardmost extremity with a face plate **34**.

The vertical side walls **36** and **38** of top channel member **18** are provided with registering bores **40** and **42**, respectively. The body portion of wall tie receiving element **32** is provided with a passage **44** that registers with bores **40** and **42**. Passage **44** terminates forwardly at face plate **34**.

Face plate **34** is provided with a centrally located substantially rectangular shaped opening **46** coinciding with and equal in length to a diameter of passage **44**.

An improved wall tie **16** is used in assembling opposite sections **12** and **14** of this wall form. Wall tie **16** consists of an elongated strip of metal stock having substantially rectangular transverse cross section. Wall tie **16** is provided with reduced end portions **48** and **50**. The width of the end portions **48** and **50** is slightly less than the width of the rectangular opening **46** in facer plate **34** and the diameter of passage **44** through wall tie receiving element **32**. At the points where reduced end portions **48** and **50** connect to the main body of the wall tie **16** there are provided weak points **52** and **53** respectively, the purpose of which will be described hereinafter.

The end portions **48** and **50** of wall tie **16** are received in the wall tie receiving elements **32** and **32A**, respectively, in a manner above described and are retained therein by improved wall tie retainer member **54** and **54A**, respectively. Wall tie retainer member **54** is substantially circular in cross-section and is preferably solid metal. The diameter of retainer member **54** is substantially equal or slightly less than the diameter of bores **40** and **42** through the vertical walls **36** and **38**, respectively, of channel member **18**, and the diameter of passage **44** through wall tie receiving element **32**.

Wall tie retainer member **54** is provided in one end portion **55** thereof with a longitudinal diameter slot **56** for receiving therein the end portion **48** of wall tie **16** when the wall tie **16** extends within receiving element **32**.

The end portion **48** of wall tie **16** is sufficiently long to extend through receiving element **32** and both vertical walls of channel member **18** to a point behind the back side of the wall form **12**. End portion **48** is provided with at least one vertical perforation **58** that registers with a corresponding perforation **60** extending through a vertical diameter of wall tie retainer member **54**, at right angles to the slot **56**. A screw, bolt, or similar connecting pin **62** is passed vertically downwardly through perforation **60** in wall tie retainer member and perforation **58** in the end **48** of the wall tie, thereby connecting wall tie **16** to retainer member **54**.

Pin **62** is located rearwardly and immediately adjacent to the back side of the channel member **18**, that is, adjacent to the back side of vertical wall **38**. Therefore, wall tie member **16** is prevented from being withdrawn from the receiving element **32**. A similar pin **62A** extends through matching perforations (not shown) in end portion **50** of wall tie **16** and wall tie retainer member **54A** to connect the form wall **14** to wall tie **16**. In this manner, the opposite form walls **12** and **14** of the wall form are effectively tied together to sustain the weight of the concrete wall **10** and prevent bulging or breaking of the form walls as concrete is poured therebetween.

After the concrete has been poured between the opposite form walls of the wall form and has "set up" the form walls of this invention are easily removed. In order to remove form walls **12** and **14** from the finished concrete wall **10** the wall ties **16** must be disconnected from the form walls. This is easily done by breaking the end portions **48** and **50** of wall tie **16** from the body portion of the wall ties at the weak points **52** and **53**.

Referring now to FIGURE 7 there is shown a wrench for breaking the wall ties **16**, preparatory to the removal of the form walls from the finished concrete wall **10**. As can be seen in that figure, the wrench **64** consists of a main body portion **66** having attached to one end thereof an elongated handle **68**. Provided near the center of the body **66** is a circular passage **70** the axis of which is substantially at right angles to the overall length of the wrench **64**. Extending diametrically across this passage **70** is a solid partition **72**.

Passage **70** has a diameter slightly greater than the diameter of the wall tie retainer member **54**. Retainer member **54** is provided in its rearward end portion **57** with a longitudinally extending diameter slot **74** for receiving therein the solid partition **72** of wrench **64** when end portion **57** is received within passage **70**.

In breaking the wall tie at the weak point **52**, wrench **64** is moved into position to receive rearward end portion **57** of wall tie retainer member **54** in passage **70** with the solid partition **72** extending into the longitudinal groove **74** in the retainer member. The handle **68** of the wrench **64** is then gripped and a force applied thereto to cause rotation of the wrench about the axis of passage **70**. Rotation of wrench **64** causes the retainer member **54** and the end portion **48** of wall tie **16** to be rotated relative to the stationary main body portion of the wall tie. Sufficient rotation of the end portion **48** of the wall tie will shear the wall tie at the weak point **52**. Retainer member **54** and the end portion **48** of wall tie **16** are then easily removed thereby releasing form wall **12** from connection to wall tie **16** and the opposite form wall **14**. Weak points **53** in end portions **50** of wall ties **16** are broken in a simi-

lar manner to release the wall ties from connection to form wall **14**.

After all the wall ties extending between the two wall forms have been released in the above described manner, the form walls are very easily moved away from the wall. It should be noted that the weak point **52** of the wall tie **16** is located adjacent to the back side of the face plate **34**, therefore when the wall tie is broken at that point and the end portion **48** of the wall tie is removed, no portion of the wall tie will extend beyond the side face of the concrete wall **10** to interfere with removal of the form walls or provide an obstacle to the finishing of the wall surfaces.

Furthermore, since the wall tie receiving element **32** extends forwardly of the face panel **30** it will become embedded within the concrete of the wall **10** when the concrete is poured between the form walls **12** and **14**. Therefore, it is preferred that the element **32** be provided with a rounded configuration to facilitate its withdrawal from the corresponding rounded depression formed in the face of wall **10** by its presence during the pouring and setting of the wall.

It will be necessary in finishing the concrete wall formed between the wall forms of this invention to fill in the above described depressions with mortar, concrete or the like. However this is a relatively simple operation and will result in an attractive, blemish free concrete wall.

Referring now to FIGURES 4, 5 and 6 there is shown an improved bracing member for furnishing lateral bracing support to the wall form of this invention. The bracing member consists substantially of an elongated timber or similar element **74** having attached to one end thereof a connecting element **76**. Connecting element **76** consists of a two-sided piece of metal such as angle iron provided on one end thereof with one or more perforations **78** to accommodate nails or similar connecting means for connecting the element **76** to one end portion of timber **74**. Element **76** is also provided on the other end thereof with a circular opening **80**, extending through side **81**, the opening being provided with diametric slot extensions **82** and **84**.

The connecting element **76** and the timber **74** are pivotally attached to the form wall **12** by a locking pin **88**. Pin **88** is received within a passage (not shown) that extends transversely through vertical reinforcing member **26**, parallel to panel facing **30**. Pin **88** is longer than the width of member **26** so that one end **86** will extend beyond the side of member **26**. An enlarged head portion **90** on one end **91** of pin **88** and diametrically opposite radially extending prongs **92** and **94** on the other end **86** of pin **88** prevent withdrawal of the pin from the passage in member **26**.

In connecting lateral support **74** to the wall form **12**, support **74** is moved into its horizontal position, perpendicular to wall form **12** to align diametric slot extensions **82** and **84** with prongs **92** and **94** on pin **88**. Side **81** of connecting element **76** is then moved adjacent to reinforcing member **26**, in proximity of the end **86** of locking pin **88**. End **86** of pin **88** is then received through circular opening **80** in side **81** with diametric slot extensions **82** and **84** accommodating radial prongs **92** and **94**. After prongs **92** and **94** have passed through slot extensions **82** and **84**, support **74** is pivoted downwardly about the axis of circular opening **80** until the end of support **74** opposite connecting element **86** contacts the ground. In this position prongs **92** and **94** are angularly offset from slot extensions **82** and **84**, preventing withdrawal of pin **88** from circular opening **80**. Therefore, support **74** is pivotally and removably attached to vertical reinforcing member **26**.

To remove support **74** from connection to form wall **12**, support **74** is pivoted into its horizontal position. Support **74** and connecting element **76** are then moved sideways away from reinforcing member **26** thereby withdrawing the end **86** of pin **88** from circular opening **80** to release support **74** from connection with member **26**.

Referring now to FIGURE 8, there is shown a wall form according to this invention for making corners in concrete wall construction. The primary wall form structure **96** is of the type above described and will not be described further herein. The secondary wall form structure **98** used in making the corner is of the same general construction as the primary wall form structure, except, the channel member **100** on the edge of wall form **98** opens rearwardly at right angles to the plane of the wall form so that lip **102** of structure **96** will be received within the groove **104** of channel member **100**.

The wall form shown in FIGURE 8 is the form used on the inside of the corner of the concrete wall. However, the wall form to be used on the outside of the concrete wall would be of similar construction except that the panel facing of the wall form, intended to lie adjacent to the surface of the concrete wall formed thereby, would be provided on the back side of the wall form instead of the frontal side as shown in FIGURE 8.

It should be noted that the various elements of the wall form of this invention although having been described as being made from a metal such as iron and the like, can be made from other materials such as wood without departing from the spirit and scope of this invention.

The wall form of this invention is easily manufactured in prefabricated sections which can be quickly and easily assembled at the job site for forming concrete walls therebetween and later disassembled and removed from the wall after the wall has been formed. The concrete wall thus formed by this wall form has a relatively smooth blemish-free exterior surface which requires a minimum amount of "finishing" to provide a smooth attractive surface.

The improved wall ties of this wall form are easily assembled, relatively strong and easily released from connection to the form walls at the completion of the job when it is desired to remove the wall form.

The lateral support members of the wall form of this invention are easily attached to the wall form during construction and are equally easily detached from the wall form at the completion of the construction. Also, these lateral support members are re-usable on subsequent concrete construction jobs.

The invention has been described by reference to specific and preferred embodiments. It will be apparent however, that many modifications can be made without departing from the spirit and scope of the invention. Accordingly, this invention should be construed not to be limited to the embodiments herein described but should be limited only by the scope of the appended claims.

What is claimed:

1. A wall form for concrete construction consisting of a plurality of interconnected wall form sections disposed on one side of said construction in opposition to a plurality of interconnected wall form sections on the other side of said construction, each of said sections comprised of:

a substantially flat reinforced structural wall body having a front side provided with a facer panel for contact with said construction, and a back side, said wall body provided along two adjacent edges with lip extensions substantially parallel to the plane of said wall body and provided along the other two adjacent edges with channel members having outwardly presented grooves for receiving therein the lip extensions of adjacent wall form sections;

a wall tie receiving element projecting from said front side of said wall body;

a circular passage extending through said wall form and through the rearward portion of said receiving element terminating forwardly in a rectangular passage that extends through the remainder of said receiving element;

an elongated wall tie having a rectangular transverse cross-section and provided inwardly of each end with a weak point, one end portion of said wall tie ex-

tending from said front side at said wall through said rectangular passage and said circular passage to a point beyond said back side of said wall form section such that the weak point in said one end portion is situated at least as far rearwardly in said circular passage as the forwardmost point in said circular passage;

a circular cross-sectioned retainer means for retaining said one end portion of said wall tie within said rectangular passage and said circular passage, the forward end portion of said retainer means extending into said circular passage and provided with a first longitudinal diametric slot for receiving therein said one end portion of said wall tie, the rearward end portion of said retainer means extending rearwardly of said wall form section and provided with a second longitudinal diametric slot;

means for connecting said one end portion of wall tie to said forward end portion of said retainer means; and

at least one wall form support element removably attached to said wall form section and inclining downwardly and rearwardly into contact with the ground.

2. A wall form according to claim **1** wherein said means for shearing said weak point is a wrench comprised of:

a head portion;

a passage extending partially through said head portion for receiving therein the rearward end portion of said retainer means;

a diametric partition extending longitudinally of the interior of said passage to be received within said second longitudinal diametric slot in said retainer means thereby to prevent rotation of said retainer means within said passage, relative to said head portion;

a handle portion extending from said head portion substantially at right angles to said passage.

3. A wall form according to claim **1** wherein said at least one support element consists of:

an elongated main body portion;

a metallic connector element having two perpendicularly intersecting sides, one end portion of said main body portion received within the angle of said two sides and attached to said connector element;

a circular perforation having diametrically opposite slot extensions provided in one of said two sides of said connector element;

a connector pin horizontally anchored in a portion of said wall body and extending parallel to said facer panel, said pin provided on one end thereof with two diametrically opposite radial extensions, said one end of said pin being received through said perforation when said connector element and attached main body are horizontal to connect said element and said main body to said wall body with said radial extensions preventing withdrawal of said one end of said pin from said perforation when said connector element and attached main body are pivoted out of horizontal position.

4. A wall form according to claim **1**, wherein said means for connecting said one end portion of said wall tie to said forward end portion of said retainer means is a connector pin that extends through registering passages in said wall tie and said retainer means, rearwardly of and immediately adjacent to said back side of said wall body.

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