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(54) **WALL BRACING**

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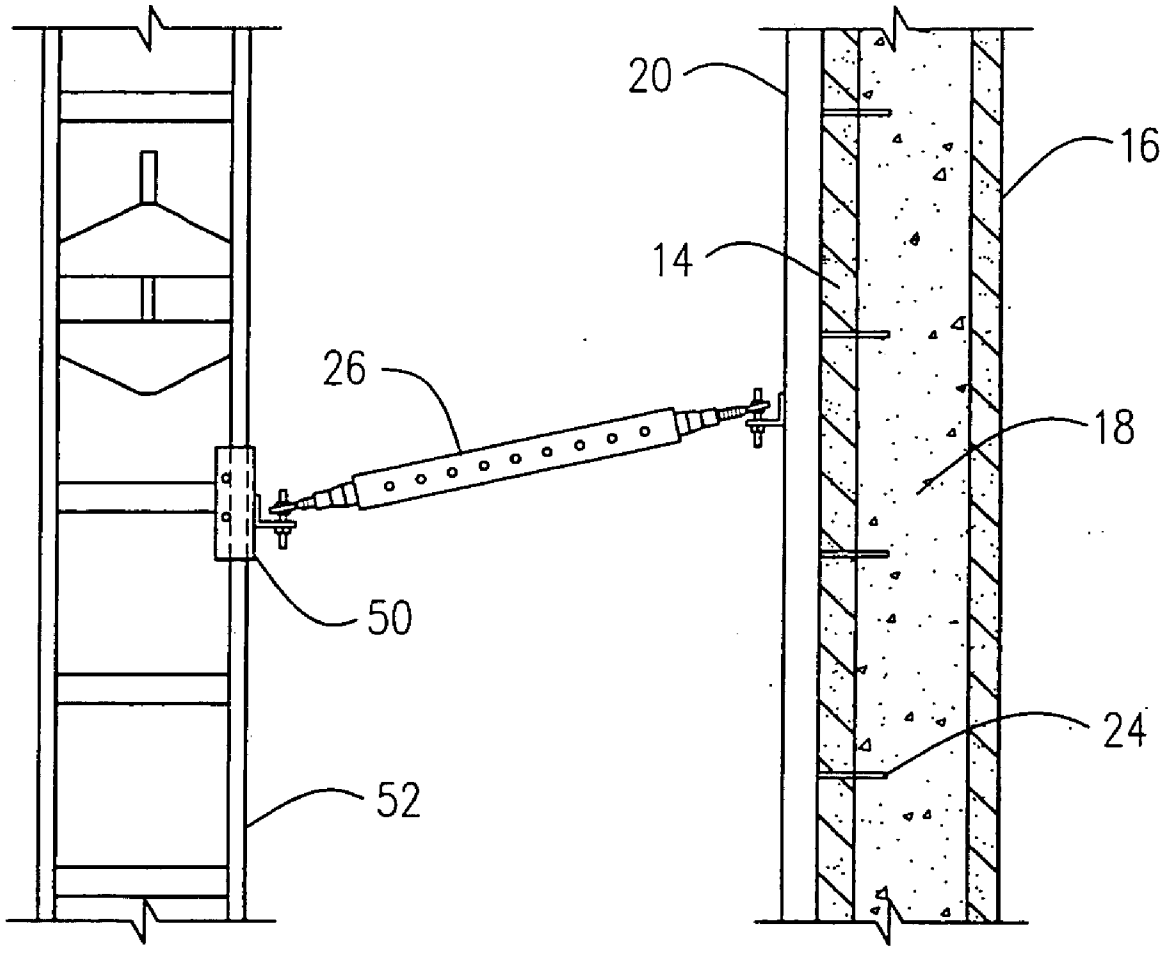
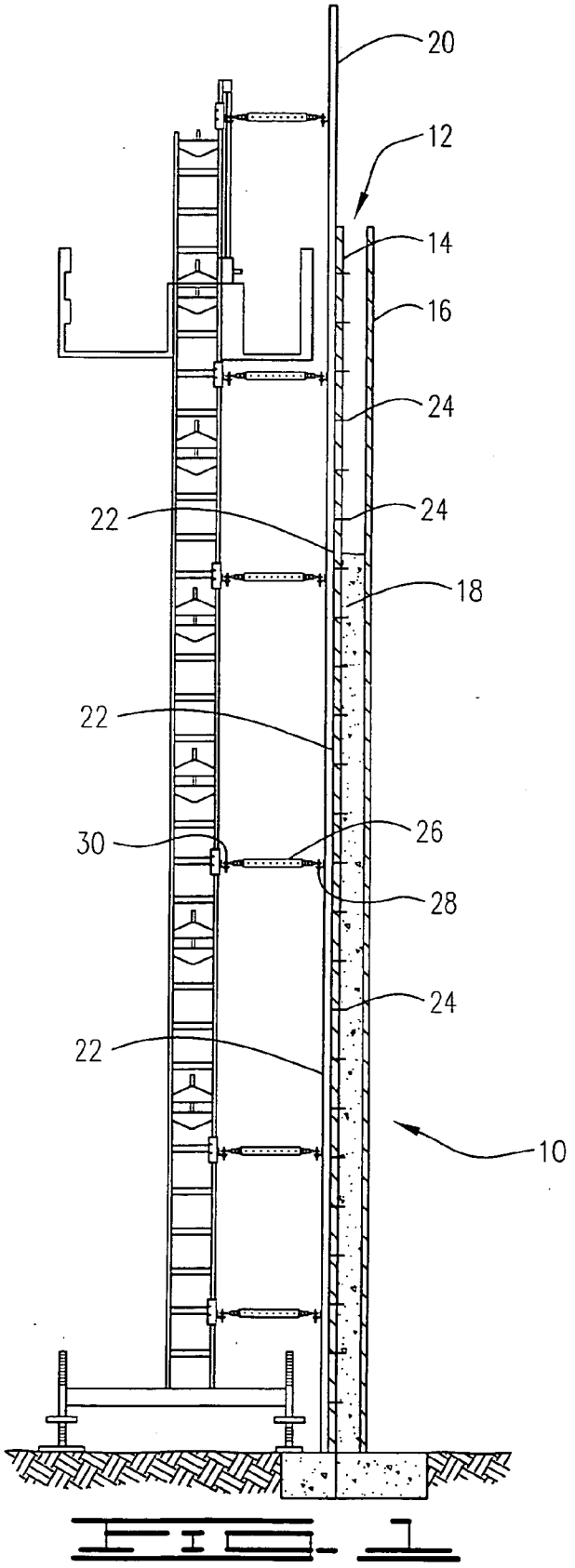
(52) **U.S. Cl.** **249/189**

(57) **ABSTRACT**

A bracing system and associated method is provided having a wall form with spatially disposed panels defining a cavity therebetween for receiving pourable building material and a substantially vertically disposed rail attached to one of the panels defining a continuous bearing surface. An anchor has a proximal end that is positionable along the bearing surface at a plurality of different elevations and is lockingly engageable to the rail at a selected elevation of the plurality of different elevations.

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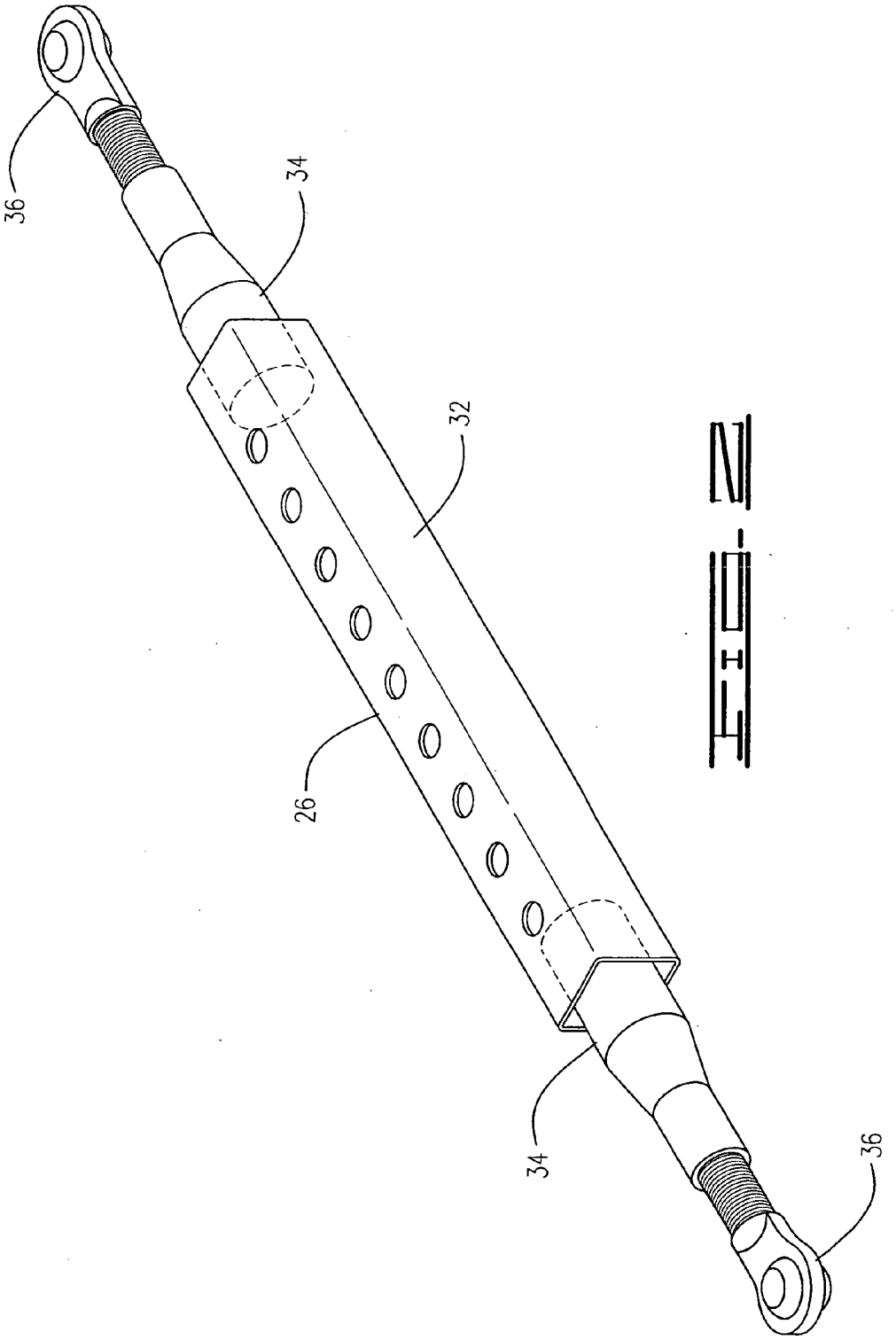


FIG. 3

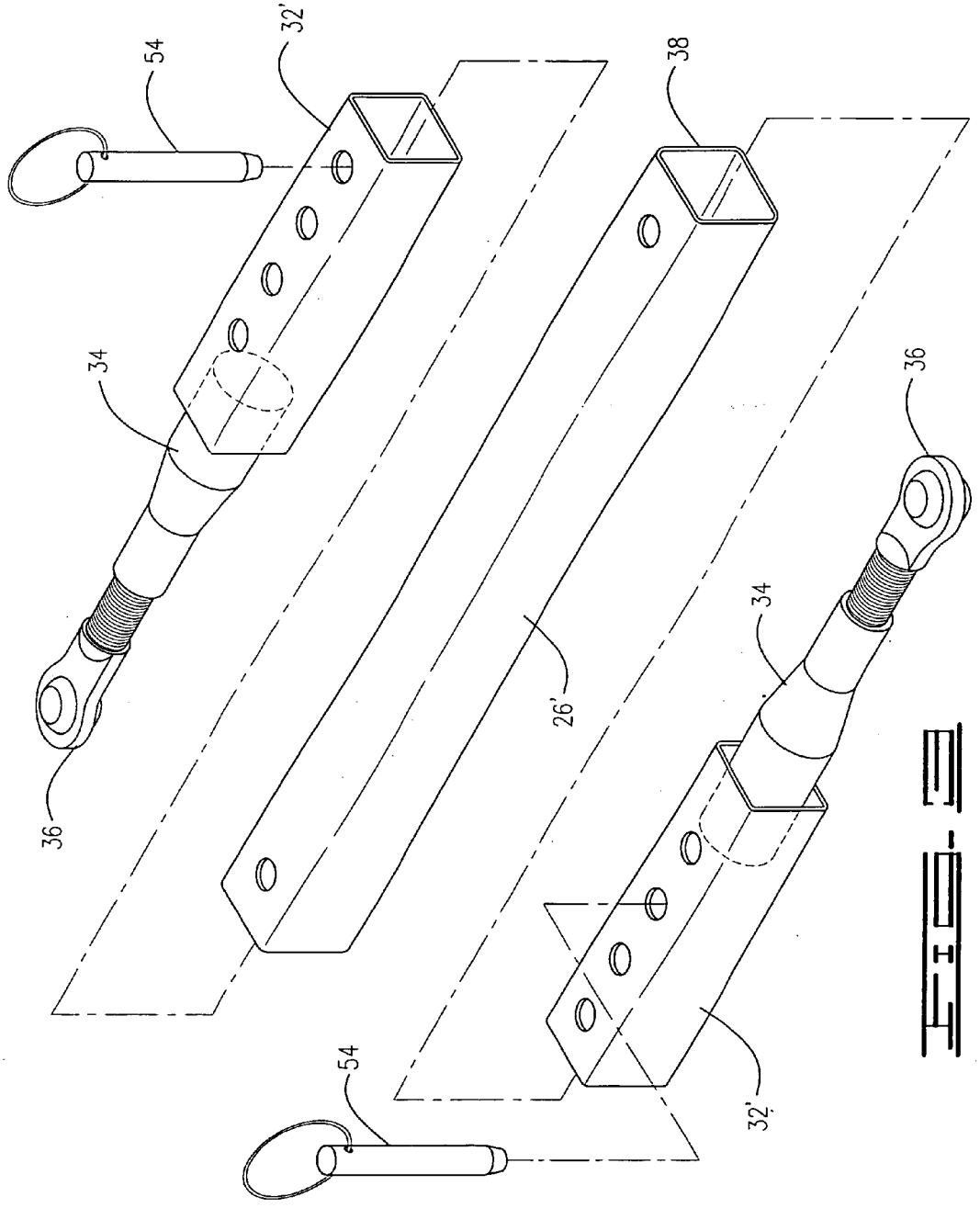


FIG. 3

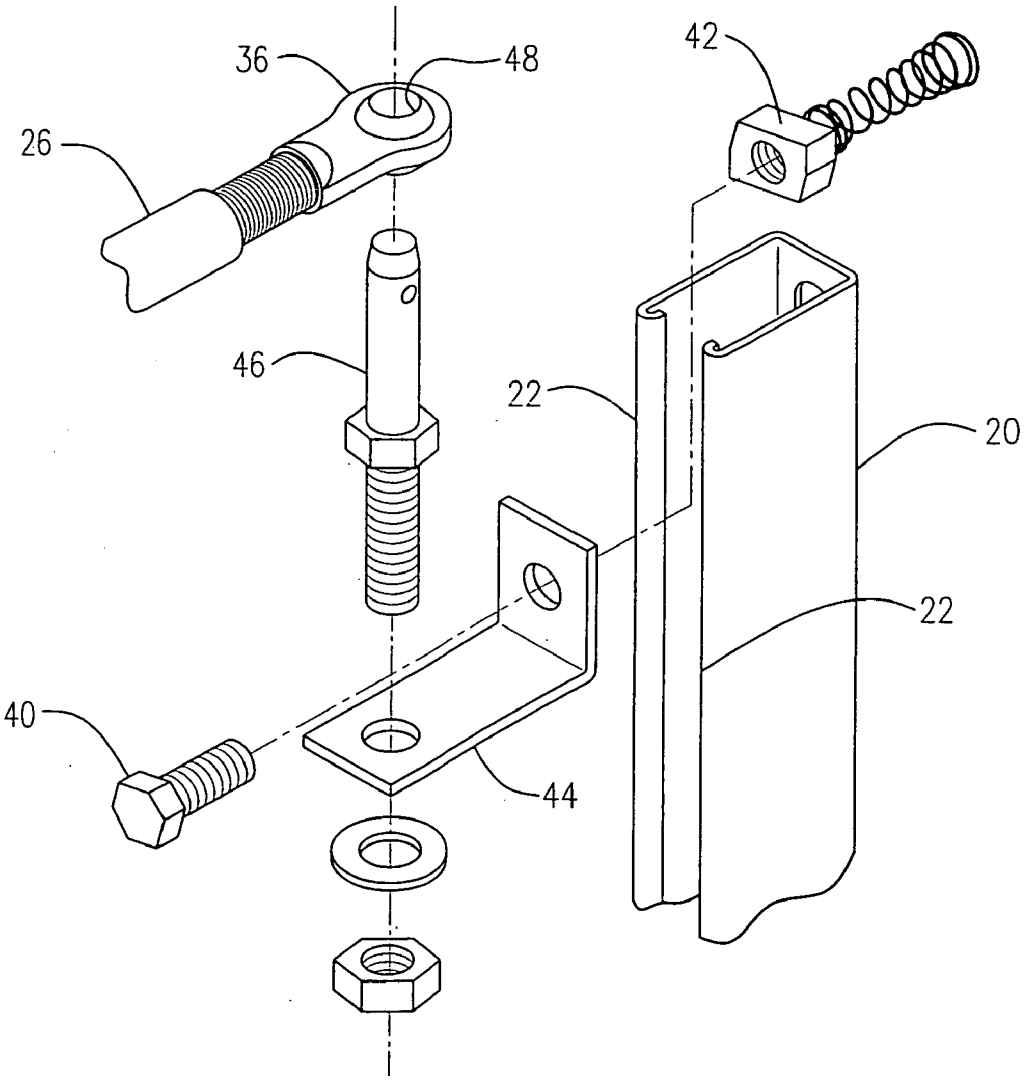
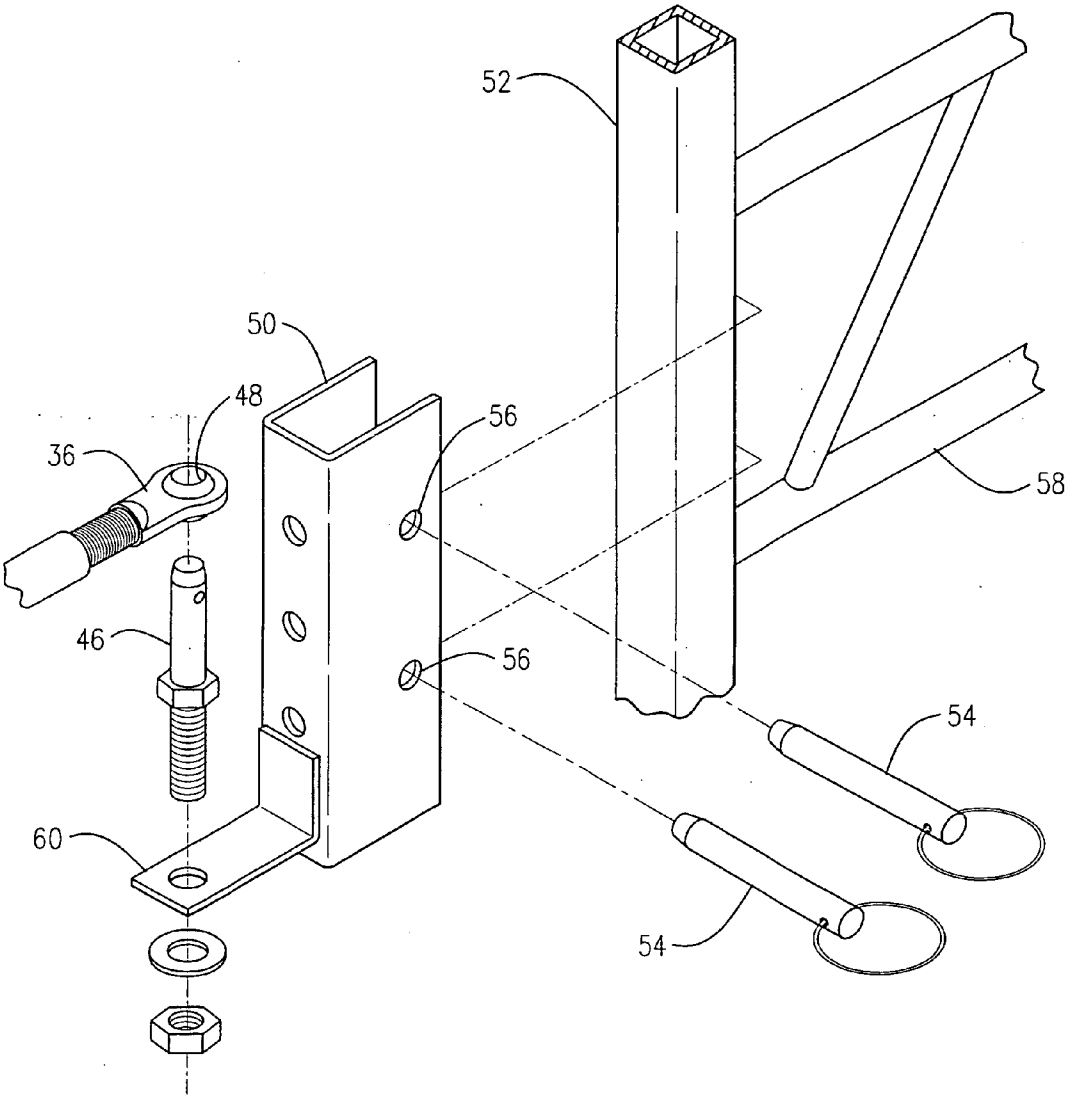


FIG. 4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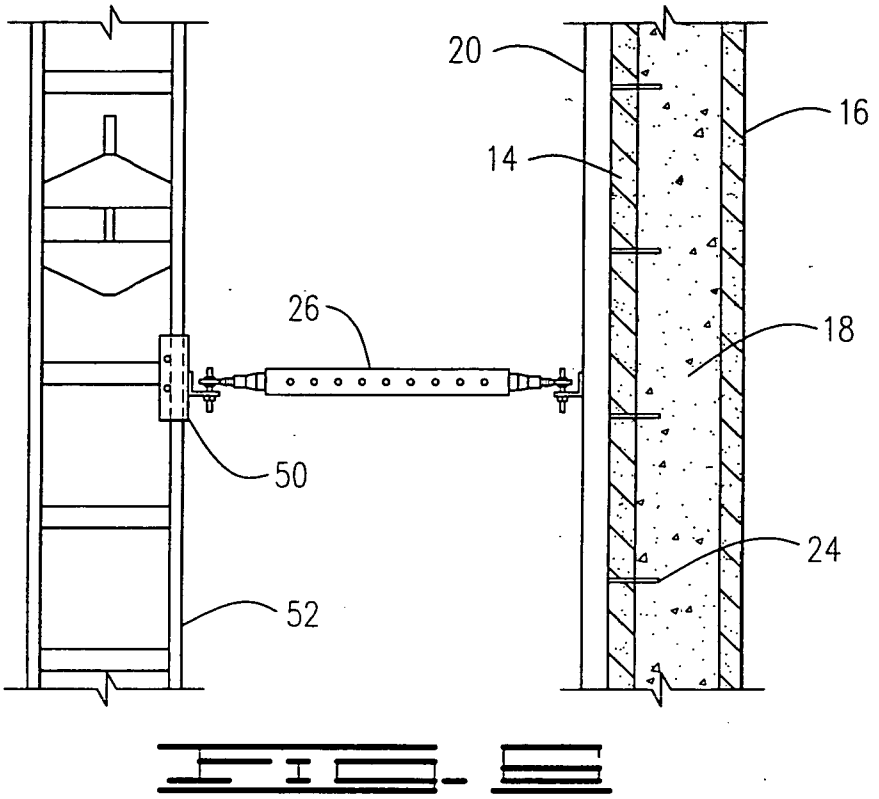


FIG. 6

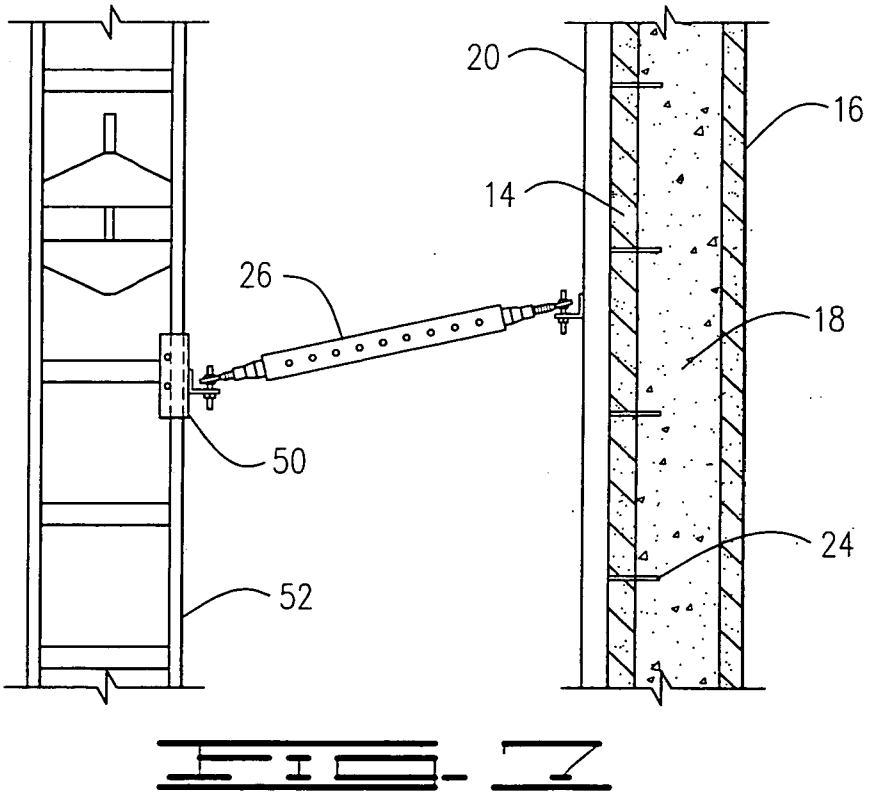
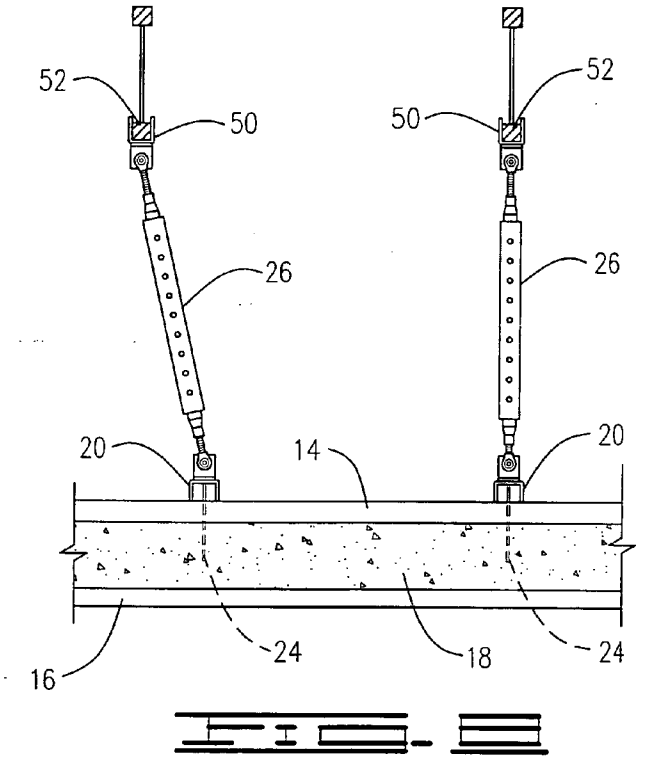


FIG. 7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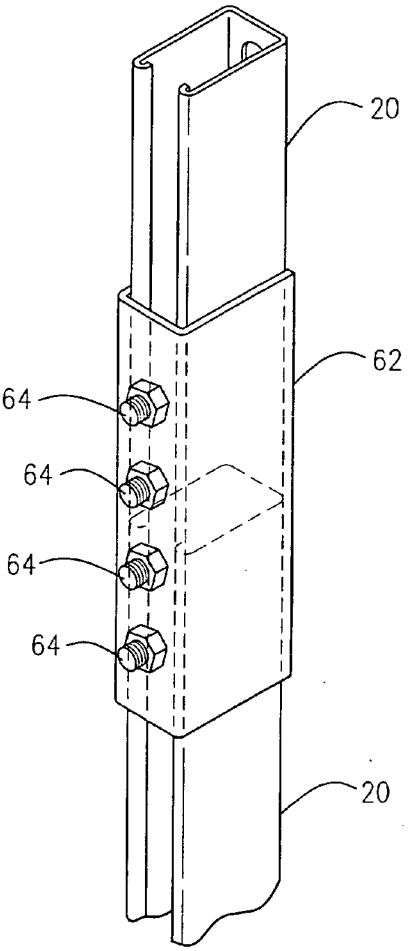
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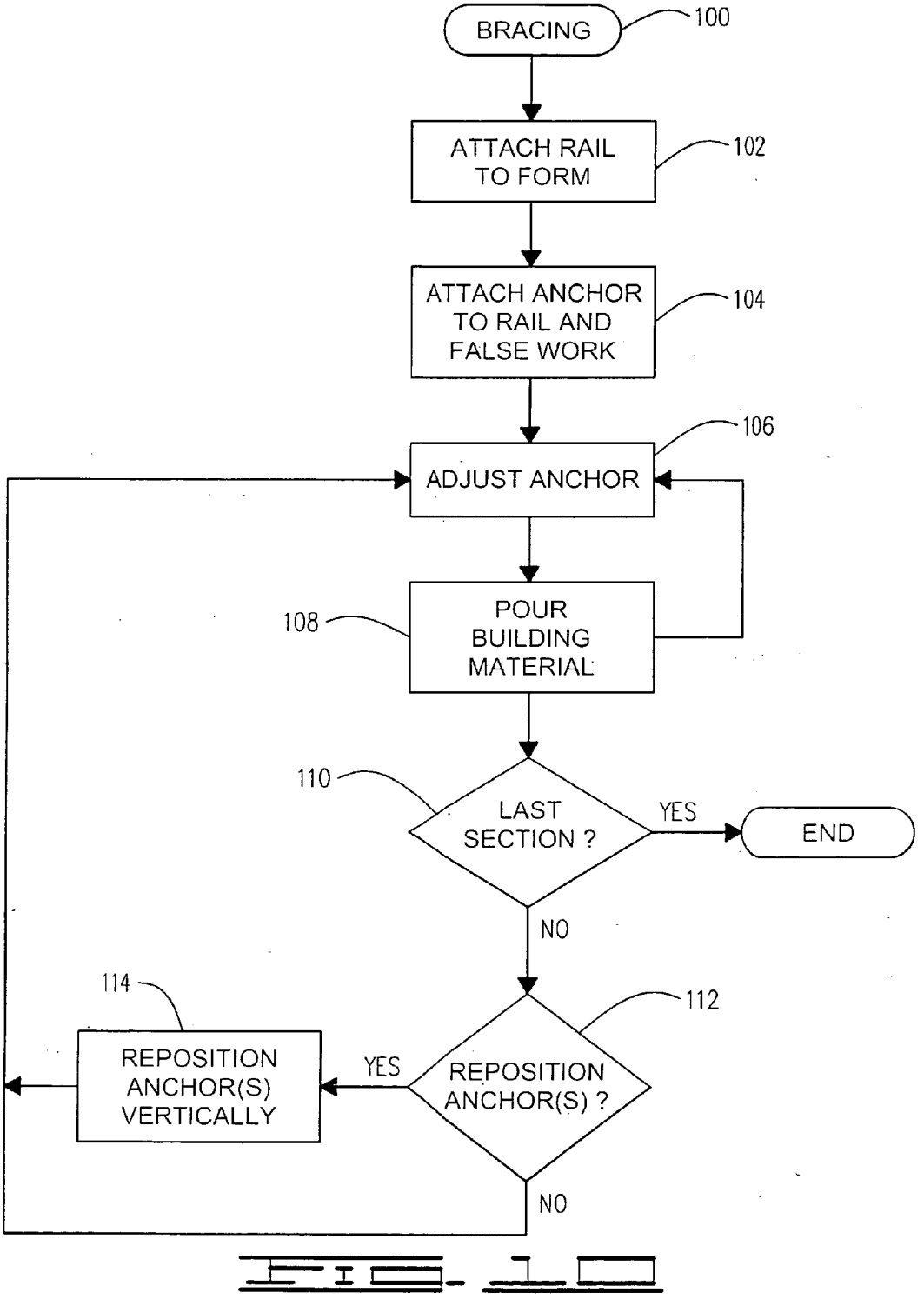
BRACING
100
ATTACH RAIL TO FORM
102
ATTACH ANCHOR TO RAIL AND FALSE WORK
104
106
ADJUST ANCHOR
108
POUR BUILDING MATERIAL
110
LAST SECTION ?
YES
END
NO
114
112
REPOSITION ANCHOR(S) VERTICALLY
YES
REPOSITION ANCHOR(S) ?
NO

WALL BRACING

RELATED APPLICATIONS

[0001] The present application makes a claim of domestic priority to U.S. Provisional Patent Application No. 60/837,107 filed Aug. 14, 2006.

FIELD OF THE INVENTION

[0002] The claimed invention relates generally to the field of construction and more particularly, but not by way of limitation, to an apparatus and method for vertically aligning a wall as it is built up.

BACKGROUND

[0003] A widely used method for constructing upstanding walls is to pour concrete in place. A poured in place wall is generally constructed by first placing forms in place and then pouring wet concrete into the form. In some instances the forms are removed after the concrete cures. In other instances an insulated concrete form ("ICF") remains an integral part of the wall. This type of construction advantageously provides a structure that is superior to conventional framing approaches in many aspects, such as in strength and insulating capability.

[0004] Technology advancements have been made in the forms and in the concrete itself in response to industry demands for tall wall structures constructed of poured in place walls; that is, walls that are more than about ten feet high. As the height of the wall grows, however, bracing the forms to ensure that the cured wall is plumb becomes more challenging. In addition to the hydrostatic pressure of the concrete itself, the bracing must also adequately counteract wind loads and worker loads, and must also exert alignment loads to cure any observed out of plane condition while the concrete is being poured or curing.

[0005] The recent improvements made in the art have significantly increased the height to which and the speed with which a poured in place wall can potentially be constructed. It is to the furthering of those improvement efforts that the embodiments of the present invention are directed by providing a bracing system that is capable of bracing and aligning the poured in place wall effectively and efficiently.

SUMMARY OF THE INVENTION

[0006] Embodiments of the present invention are generally directed to construction devices and methods employed during the building of an upstanding wall.

[0007] In some embodiments a bracing system is provided having a wall form with spatially disposed panels defining a cavity therebetween for receiving pourable building material and a substantially vertically disposed rail attached to one of the panels defining a continuous bearing surface. An anchor has a proximal end that is positionable along the bearing surface at a plurality of different elevations and is lockingly engageable to the rail at a selected elevation of the plurality of different elevations.

[0008] In some embodiments a method is provided for bracing a poured in place wall made with an upstanding wall form defining a cavity that receives pourable building material, comprising anchoring the wall form at a selected elevation from a continuous plurality of predetermined vertically aligned anchor positions.

[0009] In some embodiments a bracing system is provided for a poured in place wall including an upstanding falseworks and means for aligning the wall by anchoring the wall to the falseworks at one or more selected vertical positions of a plurality of predetermined continuously vertical positions of the wall as is determined in relation to observing a wall out of plane condition as the wall is poured.

[0010] These and various other features and advantages which characterize the claimed invention will become apparent upon reading the following detailed description and upon reviewing the associated drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0011] FIG. **1** is an elevational depiction of a bracing system constructed in accordance with embodiments of the present invention.

[0012] FIG. **2** is an isometric depiction of an anchor of the bracing system of FIG. **1** and constructed in accordance with embodiments of the present invention.

[0013] FIG. **3** is an isometric depiction of an anchor constructed in accordance with alternative embodiments of the present invention.

[0014] FIG. **4** is an exploded isometric depiction of the attachment of the anchor to the wall form.

[0015] FIG. **5** is an exploded isometric depiction of the attachment of the anchor to the falseworks.

[0016] FIG. **6** is an enlarged detail of a portion of the bracing system of FIG. **1** depicting the anchor in a substantially horizontal disposition.

[0017] FIG. **7** is a view similar to FIG. **6** but with the anchor in a vertically angled disposition.

[0018] FIG. **8** is a top view similar to FIG. **6** with the anchor in a laterally angled disposition.

[0019] FIG. **9** is an isometric depiction of a splice cap joining the ends of two rails together.

[0020] FIG. **10** is a flowchart depicting steps in a method for BRACING in accordance with embodiments of the present invention.

DETAILED DESCRIPTION

[0021] Referring to the drawings in general, and more particularly to FIG. **1** that shows a bracing system employed in the pouring in place of a wall **10**. A wall form **12** is generally depicted as having spatially disposed panels **14**, **16** defining a cavity therebetween for receiving pourable building material **18**, such as concrete although the present embodiments are not so limited to concrete. In some embodiments the panels **14**, **16** can be manifested as removable concrete forms, and in equivalent alternative embodiments the panels **14**, **16** can be manifested as opposing sides of the plurality of stacked ICFs.

[0022] A substantially vertically disposed rail **20** is attached to the panel **14** defining a continuous bearing surface **22**. The rail **20** is preferably attached to the wall form **12** by a plurality of rail fasteners **24** having a distal end that is operably disposed in the cavity and thereby embedded in the pourable material **18**. This lends strength to the attachment of the rail **20**. By using threaded fasteners for the rail fasteners **24**, they can subsequently be easily removed from the cured building material **18** for removing the rail **20** when the wall is completely poured and cured. A pilot hole can be preliminarily drilled into the wall form **12** to threadingly engage the rail fasteners **24** to a support member of the wall

form **12** before the building material **18** is poured. For example, the rail fasteners **24** can preliminarily threadingly engage a center stave of the respective ICF to support the rail **20** until the building material **18** is poured and cured.

[0023] One or more anchors **26** have a proximal end **28** that is positionable along the bearing surface **22** at a plurality of different elevations, and is lockingly engageable to the rail **20** at a selected elevation of the plurality of different elevations. With the continuous bearing surface **22** continuously spanning the upright wall form **12**, the selected positions for placing each anchor **26** can be determined empirically by observing any out of plane condition that presents itself as the building material **18** is poured. Also, the poured in place wall **10** is typically poured in sections of a predetermined height. As lower previously poured sections cure, the anchors **26** can advantageously be moved upwardly along the bearing surface **22** to brace the wall form **12** where new building material **18** is to be poured.

[0024] A distal end **30** of each anchor **26** is positionable along upstanding falseworks at a plurality of different elevations and lockingly engageable to the falseworks at a selected elevation of the plurality of different elevations. For purposes of this description and meaning of the appended claims, the term "falseworks" means generally a structural member to which bracing can be attached for temporarily supporting loads during construction. In the illustrated embodiments of FIG. **1** the falseworks is manifested as a climbing scaffold, although the present embodiments are not so limited. In equivalent alternative embodiments other types of scaffolding can be employed, such as but not limited to tower scaffolding, or other types of upstanding structural members such as but not limited to existing structures.

[0025] FIG. **2** depicts anchor **26** embodiments contemplating a structural member **32** having threaded sockets **34** fixed at both ends thereto. The sockets **34** can be fixed in any conventional manner such as but not limited to welding, crimping, use of fasteners, and the like. Ball joints **36** opposingly threadingly engage the sockets **34**, providing a turnbuckle that can be adjusted to impart a selected tensile force or compressive force on the wall form **12**. Although not shown, a locking nut can be used on one or both ends to threadingly engage against the respective socket **34**, thereby fixing the length of the turnbuckle and preventing inadvertent change in the length by rotating the structural member **32**.

[0026] During reduction to practice of the present embodiments it was determined that the structural member **32** can be made of 12 gauge 1.5 inch square tubing about 24 inches long. The sockets **34** and ball joints **36** can be made by modifying a category O tractor implement and welding each socket **34** inside the respective open end of the structural member **32**. FIG. **3** depicts embodiments whereby the effective length of an anchor **26'** can be easily adjusted by making a structural member **32'** of two parts and slidingly engaging them within a sleeve **38**. Holes in each structural member **32'** can be aligned with a hole in the sleeve **38** and pinned thereat to fix the effective length of the anchor **26'**.

[0027] FIG. **4** is an exploded isometric depiction of embodiments contemplating the upstanding rail **20** manifested as a substantially U-shaped structural member. During reduction to practice of the present embodiments it was determined that the rail **20** can be constructed, for example, of a Unistrut component part number P5500. In these embodiments the rail **20** defines a longitudinal channel for operably passing an anchor fastener **40** to engage a backing nut **42** operably disposed inside the channel. A clip **44** can thus be removably attached at the selected elevation to the bearing surface **22**. The clip **44** supports an upstanding smooth pin **46** that is sized to be receivingly engageable in an opening **48** in the ball portion of the ball joint **36**.

[0028] FIG. **5** is an exploded isometric depiction of embodiments contemplating a clip **50** that is sized to slidingly engage an upstanding portion **52** of the scaffolding of FIG. **1** to a selected position of a plurality of possible vertical positions. The clip **50** can be fixed at a selected position by inserting a pin **54** through openings **56** (only one depicted) in the clip **50**, thereby abuttingly engaging a cross member **58** of the scaffolding. The clip **50** has a protuberant portion **60** that supports another smooth pin **46** that is likewise sized to be receivingly engageable in the opening **48** in the ball portion of the ball joint **36**.

[0029] FIG. **6** is an enlarged detail view of a portion of the bracing system of FIG. **1**, depicting the anchor **26** in a substantially horizontal disposition. The pinned ball joint arrangement of the anchor **26** advantageously permits attaching the anchor **26** to the rail **20** at an angled disposition vertically as depicted in FIG. **7**, and/or at an angled disposition laterally as depicted by the top view of FIG. **8**. In any of these straight or angled dispositions the turnbuckle can be used to apply either a tensile or a compressive force to align the wall form **12** as the wall **10** is built.

[0030] FIG. **9** depicts a splice cap **62** that can be used to strengthen a joint where two section of the rail **20** come together. The splice cap **62** depicted is a U-shaped structural member with through holes for admitting bolts **64** to engage backing nuts (not shown) as described above.

[0031] FIG. **10** is a flowchart of steps in a method **100** for bracing a poured in place wall made with an upstanding wall form defining a cavity that receives pourable building material. The method **100** generally permits anchoring the wall form **12** at a selected elevation from a continuous plurality of predetermined vertically aligned anchor positions.

[0032] The method **100** begins at block **102** by attaching the rail **20** to the upstanding wall form **12**. In block **104** one or more anchors **26** are attached to the rail **20** at one end and to the falseworks at the other end. In block **106** the anchors **26** are adjusted to apply the necessary tensile or compressive force to align the wall form **12** vertically. Although control then passes to block **108** where the building material **18** is poured, it will be noted that the anchors **26** can be continuously adjusted as necessary in block **106**, including repositioning them as necessary, while the building material **18** is poured and cures.

[0033] In block **110** it is determined whether the last section of building material **18** has been poured. If the determination of block **110** is yes then the method **100** ends; otherwise it is determined in block **112** whether any anchors **26** are to be moved in preparation for the next section of building material **18**. If the determination of block **112** is yes, then the anchors are repositioned vertically in block **114**. In any event control then returns to block **106**.

[0034] The present embodiments generally contemplate a bracing system for a poured in place wall comprising an upstanding falseworks, and means for aligning the wall by anchoring the wall to the falseworks at one or more selected vertical positions of a plurality of predetermined continuously vertical positions of the wall as is determined in relation to observing a wall out of plane condition as the wall is poured. For purposes of this description and meaning of the appended claims, the term "means for aligning" is expressly limited to the disclosed embodiments and equivalents whereby the bearing surface **22** continuously spans the upstanding wall form **12** so as to provide a plurality of predetermined and selectable anchor positions. This struc-

ture advantageously permits selecting an anchor position empirically, after the pouring of the building material commences, such as would be based on observing an out of plane condition as the building material **18** is poured or cures. The term "means for aligning" expressly does not contemplate previous attempted solutions whereby a noncontinuous upstanding bearing surface is employed.

[0035] It is to be understood that even though numerous characteristics and advantages of various embodiments of the present invention have been set forth in the foregoing description, together with details of the structure and function of various embodiments of the invention, this detailed description is illustrative only, and changes may be made in detail, especially in matters of structure and arrangements of parts within the principles of the present invention to the full extent indicated by the broad general meaning of the terms in which the appended claims are expressed. For example, the particular elements may vary in type or arrangement without departing from the spirit and scope of the present invention.

[0036] In addition, although the embodiments described herein are directed to a bracing system for a poured in place wall, it will be appreciated by those skilled in the art that the claimed subject matter is not so limited and various other construction systems can utilize the present embodiments without departing from the spirit and scope of the claimed invention.

What is claimed is:

1. A bracing system comprising:

a wall form having spatially disposed panels defining a cavity therebetween for receiving pourable building material and a substantially vertically disposed rail attached to one of the panels defining a continuous bearing surface; and

an anchor having a proximal end that is positionable along the bearing surface at a plurality of different elevations and lockingly engageable to the rail at a selected elevation of the plurality of different elevations.

2. The system of claim **1** wherein the anchor has a distal end that is positionable along upstanding falseworks at a plurality of different elevations and lockingly engageable to the falseworks at a selected elevation of the plurality of different elevations.

3. The system of claim **1** wherein the rail is attached to the wall form by a rail fastener having a distal end that is operably disposed in the cavity and thereby embedded in the pourable material.

4. The system of claim **3** wherein the rail fastener is a threaded fastener that operably threadingly engages a support member of the wall form before the building material is poured.

5. The system of claim **1** wherein the rail comprises a substantially U-shaped structural member defining a longitudinal channel for operably passing an anchor fastener to engage a backing nut inside the channel in attaching the anchor to the bearing surface.

6. The system of claim **5** comprising a first clip removably attachable to the bearing surface and supporting, in turn, the anchor proximal end.

7. The system of claim **6** wherein the clip supports a pin that is slidingly engageable with the anchor proximal end.

8. The system of claim **7** wherein the anchor proximal end comprises a ball joint with an opening in a ball of the ball joint that is sized to receivingly engage the pin.

9. The system of claim **8** wherein a distal end of the anchor comprises a ball joint.

10. The system of claim **9** wherein the anchor comprises a turnbuckle medially disposed between the ball joints.

11. The system of claim **10** further comprising a second clip that is positionable along a falseworks and pinnable thereto at a selected elevation of a plurality of different elevations, wherein the second clip supports a second pin that is receivingly engageable in an opening a ball of the distal end ball joint.

12. The system of claim **11** wherein the falseworks comprises climbing scaffolding.

13. A method for bracing a poured in place wall made with an upstanding wall form defining a cavity that receives pourable building material, comprising anchoring the wall form at a selected elevation to a bearing surface defining a continuous plurality of predetermined vertically aligned anchor positions.

14. The method of claim **13** wherein the anchoring step comprises attaching a longitudinally extending rail to the wall form in a substantially vertical disposition.

15. The method of claim **14** wherein the attaching step comprises engaging a fastener through a portion of the rail and through a support member of the wall form in the cavity.

16. The method of claim **14** wherein the anchoring step comprises positioning an anchor at the selected elevation from the continuous plurality of predetermined vertically aligned positions and fixing the anchor to the rail at the selected position.

17. The method of claim **16** wherein the anchoring step comprises removably fixing a first pin to the rail and a second pin to upstanding falseworks, and slidingly engaging first and second ends of an anchor member to the first and second pins, respectively.

18. The method of claim **17** wherein the anchoring step comprises providing the anchor member with ball joints at the first and second ends thereof with openings in ball members of the ball joints for receivingly engaging the first and second pins.

19. The method of claim **18** wherein the anchoring step comprises providing the anchor member with a turnbuckle medially disposed between the ball joints.

20. The method of claim **19** comprising:

attaching one end of the anchor member to the falseworks and the other end of the anchor member to the rail at a first elevation;

pouring a first section of building material;

moving the anchor member vertically and reattaching it to the falseworks and to the anchor member at a different elevation; and

pouring a second section of building material.

21. A bracing system for a poured in place wall comprising:

an upstanding falseworks; and

means for aligning the wall by anchoring the wall to the falseworks at one or more selected vertical positions of a plurality of predetermined continuously vertical positions of the wall as is determined in relation to observing a wall out of plane condition as the wall is poured.

* * * * *