SYSTEM AND METHOD FOR PRECISION GRINDING AND SELF-LEVELING INSTALLATION OF CONCRETE MASONRY SYSTEMS

Inventor: Alan C. Ferguson, Dacula, GA (US)

Correspondence Address:
BOURQUE & ASSOCIATES
INTELLECTUAL PROPERTY ATTORNEYS
P.A.
835 HANOVER STREET, SUITE 301
MANCHESTER, NH 03104 (US)

Assignee: FSN, LLC, Manchester, NH (US)

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ABSTRACT
A stackable building block 1102 for constructing a masonry wall includes a front section 502 having an outer surface, an inner surface, a bottom surface, and a top surface. The top surface may be divided into a higher surface 1111 positioned between two lower surfaces 1100. The building block also has a rear section 504 substantially parallel to the front section having an outer surface, an inner surface, a bottom surface, and a top surface. Two or more webs 1106 coupling the inner surface of the front section to the inner surface of the rear section have a top surface and a bottom surface. Two or more pairs of lugs 508 may extend above the top surface of the front section and the top surface of the rear section. During manufacturing the higher surface of the top surface is ground to a precision height. During assembly of the stack building block, a thin set mortar, grout or adhesive is used between successive courses.
SYSTEM AND METHOD FOR PRECISION GRINDING AND SELF-LEVELING INSTALLATION OF CONCRETE MASONRY SYSTEMS

CROSS-REFERENCE TO RELATED APPLICATIONS


TECHNICAL FIELD

[0002] The present invention relates to stack concrete masonry systems for building structural load bearing and non-load bearing walls and, more particularly, to a system and method that utilizes precision grinding of a small top portion of masonry blocks in addition to a masonry adhesive or grout that “self-levels” the masonry blocks to provide for accurate and simplified assembly of concrete masonry.

BACKGROUND INFORMATION

[0003] Present masonry construction techniques provide for essentially two masonry construction techniques: the traditional mortared block technique where mortar is placed between each block both on a horizontal face as well as a vertical face; and a newer technique of dry stacking where blocks are designed to be simply placed one upon the other in some arrangement without any mortar between the blocks themselves (although cement may be later placed in spaces within the stacked blocks). An advantage of dry stack masonry systems is that the labor component of installation can be dramatically reduced. Some studies have shown that dry stack masonry systems are up to ten times faster to install than conventional joint mortared masonry systems and require a significantly less skilled labor force to install them. Because these systems do not use bonding mortar to provide joint support, it may be necessary to use other means of developing wall strength to meet various building codes.

[0004] For example, various building codes may require dry-stacked concrete block cells to be filled with cement in order to provide specified structural integrity. Some applications may require all the cells to be filled with concrete. Other applications may require the concrete to be poured into distinct vertical columns and only in certain cells or cores of the block. These applications may require cells, for example, to be filled generally at four foot on center increments and/or at wall corners and Jambs of windows and doors or various load points. A general overview of the use of current dry stack methods in masonry wall construction can be found in National Concrete Masonry Association’s (NCMA) technical publication TEK 14-22 “Design and Construction of Dry-Stack Masonry Walls” Incorporated herein by reference.

[0005] Currently, the accepted practice for constructing with concrete masonry units using the traditional mortared technique (structural concrete block) requires that the blocks be mortared together with a code approved masonry mortar mix. Typical masonry mortar mixes contain portland cement, lime and mason sand, as well as additives for improving workability. These masonry mortar mixes are applied and installed by an experienced mason using a trowel. The trowel has been used in constructing masonry walls for thousands of years. As a result, the availability of a skilled mason applying mortar with a trowel becomes the limiting factor in the low fast a masonry wall can be constructed. The amount of labor cost to install a masonry wall is currently in the range of 66% to 75% of the overall masonry construction costs.

[0006] There have been attempts to change the dynamics of the masonry construction market in an attempt to lower the labor expenses associated with typical block concrete construction. As a result, many systems have attempted to eliminate the need for mortar during construction of the wall. The dry-stack masonry wall describes above is one such example. By eliminating the mortar step, the installer should be able to do much faster in erecting walls. The issue with current mortarless systems, however, is that these systems do not have sufficient height control to duplicate the height control capability of a mortar joint between block that can be adjusted to take care of concrete masonry units block height irregularities. The mortar, besides providing bonding and sealing, also serves as a leveling mix that provides a way for the wall builder to adjust the height and level of the courses to meet the specific dimensions for openings and top of wall elevations. Moreover, dry stack masonry walls may not have the same load strength as traditional mortared masonry walls and many building codes recognize this and are reluctant to change to allow dry-stack masonry walls in many applications.

[0007] Accordingly, a need exists for a system and method that provides a masonry block having predetermined area (that is smaller than full top surface area of the masonry block) that can be ground down to a precise level to ensure that there will be no “rocking” or un-levelness in the stacked blocks and that are installed using a non-trowel applied grout or adhesive which serves to adhere the blocks together without the need to use skilled masons using trowels.

SUMMARY

[0008] In order to solve the problems associated with conventional mortared masonry and with the mortar less/dry-stacked methods of building masonry walls, a new system was developed. This novel system combines wet-stacking with self-leveling and a precision grinding method. This system eliminates the need for trowel-applied mortar. The system dramatically reduces the need for highly skilled masons in the overall construction crew, while also providing nearly the speed of conventional dry-stack systems.

[0009] In one aspect the invention features a method of producing a stackable building block for constructing a masonry wall. The method comprises the acts of molding a concrete block having a front section coupled to and substantially parallel with a rear section. Each front and rear sections has a bottom surface and a top surface, wherein the top surface on both the front and rear sections includes a central region having a height which is greater than the first and second end regions located on either side of the central region. The method also includes grinding the central region of the top surface of the front and rear block sections to a predetermined height.

[0010] The method of producing a stackable building block for constructing a masonry wall utilizes a building block that is a dry stackable concrete block. Alternatively, the method of producing a stackable building block for constructing a masonry wall utilizes a building block that is a wet stackable concrete block.
In another aspect of the invention, the method of producing a stackable building block for constructing a masonry wall includes a central region that has an undulating surface.

In a further embodiment of the invention, the method of producing a stacked building block wall utilizing the stackable building block further comprises applying a flowable, thin set mortar onto the top surface of the stackable building block using a high speed applicator. The high speed application may be a grout bag. The mortar is applied to a thickness of ¼ of an inch or less.

In another embodiment of the invention, the grinding of the higher surface of the top surface is precision ground to provide a stack building block of a specific precision height.

In an additional embodiment of the invention, the central region of the top surface further includes a plurality of indents or serrations or channels. The method of producing a stacked building block wall utilizing the stackable building block further comprises the acts of applying a flowable, thin set mortar onto the top surface of the stackable building block using a high speed applicator and allowing the mortar to enter the plurality of indents or serrations or channels on the central region of the top surface, wherein the addition of the mortar does not significantly increase the specific precision height of the stackable building block.

Another embodiment of the application further comprises stacking a second duplicate stack block staged halfway off-center and stacking a third duplicate stack block staged halfway off-center in a direction opposite and adjacent to the second stack block.

In a further aspect of the invention, the stack building block has a chamfered or beveled edge on one more exterior edges of the building block.

It is important to note that the present invention is not intended to be limited to a system or method which must satisfy one or more of any stated objects or features of the invention. It is also important to note that the present invention is not limited to the preferred, exemplary, or primary embodiment(s) described herein. Modifications and substitutions by one of ordinary skill in the art are considered to be within the scope of the present invention.

BRIEF DESCRIPTION OF THE DRAWINGS

These and other features and advantages of the present invention will be better understood by reading the following detailed description, taken together with the drawings wherein:

FIG. 1A is a top plane view and FIG. 1B is a front cross sectional view of a prior art conventional dry stack block assembled into a linear wall structure.

FIGS. 2A, 2B, and 2C are views of the present invention comprising two dry-stack units, a stretcher unit and a corner unit shown here assembled into a wall structure turning a 90 degree corner according to an exemplary pin embodiment.

FIG. 3 is a perspective view of present invention comprising the two dry-stack units, the stretcher unit and the corner unit shown here assembled into a linear wall structure according to the exemplary pin embodiment.

FIG. 4A is a top plane view and FIG. 4B is a side profile view of the stretcher unit according to an exemplary embodiment of the invention with webs at non-right angles.

FIG. 5A is a top plane view and FIG. 5B is a side profile view of the stretcher unit according to an exemplary embodiment of the invention with webs at right angle.

FIG. 6A is a top plane view; FIG. 6B is a cross sectional view; FIG. 6C is a front profile view; and FIG. 6D is a side profile view of the stretcher unit according to an exemplary edge-grinding and exemplary pin embodiment.

FIG. 7A is a top plane view; FIG. 7B is a front profile view; and FIG. 7C is a side profile view of the corner unit according to an exemplary pin embodiment.

FIG. 8A is a top plane view and FIG. 8B is a front cross sectional side view of the stretcher unit assembled into a linear wall structure.

FIG. 9 is a perspective view of the stretcher units stack-bonded construction.

FIG. 10A is a top plane view; FIG. 10B is a cross sectional view; FIG. 10C is a front profile view; and FIG. 10D is a side profile view of the stretcher unit according to an exemplary chamfered edge embodiment with precision ground top and recessed lug edge.

FIG. 11A is a side profile view; FIG. 11B is a top plane view of the stretcher unit according to an exemplary edge-grinding embodiment; FIG. 11C is a side profile view of the stretcher unit.

FIG. 12A is a side profile view and FIG. 12B is a top plane view of the stretcher unit according to a second exemplary edge-grinding embodiment.

FIG. 13A is a front profile view and FIG. 13B is a top plane view of the corner unit according to an exemplary edge-grinding embodiment.

DETAILED DESCRIPTION

A corner wall structure 200 may use a stretcher unit 202 and a corner unit 204 to construct the corner and straight portions of a wall, as shown in FIGS. 2A, 2B, and 2C. The stretcher units 202 have lugs 206 that extend above the top of the stretcher unit 202. The next course of stretcher units is placed on top of the previous layer of stretcher units. The lugs 206 of the previous layer of stretcher units extend into the cells of the next course of stretcher units. The lugs provide face shell alignment, lateral strength, and lock together successive layers of units.

The stretcher units 202 have a front section and a rear section. One or more webs or ribs couple the front section to the rear section. The one or more webs may extend just below the top surface of the stretcher unit 202 or may extend all the way to the top surface of the stretcher unit 202. The stretcher units 202 also have lugs that extend above the top surface of the stretcher unit 202. The stretcher unit 202 and other exemplary embodiments of the stretcher unit 202 will be described in greater detail later herein. The corner units 204 may also have a front section, rear section, and one or more webs coupling the front section and rear section. The corner unit also has a side section. The side section provides a ninety-degree corner in the wall. The corner unit 204 provides a uniform surface at the corner of the wall. The corner units 204 are staggered with each successive row. The corner unit 204 and other exemplary embodiments of the stretcher unit 202 will be described in greater detail later herein.

The corner unit 204 may not have lugs extending from the top. Deformable pegs 208 in peg holes 210 may be used to position the corner unit 204 during construction. The deformable pegs 208 may be made of, for example, copper tubing. The exemplary dimensions of the copper tubing may
be about ¼ inch diameter with length of about one inch. The copper tubing allows the peg 208 to deform with relative little force and remain in the deformed shaped. The distorted shape of the deformable peg 208 holds the units in a plumb and square position during construction phase. The deformable pegs 208 are not limited to a metal tubing. The deformable peg 208 may be made from a variety of materials that sufficiently lack memory and provide desired strength, for example, metals, metal alloys, composites, plastics, and polymers. The deformable pegs 208 are not limited to a tubular structure. The deformable peg 208 may be, for example, solid, a variety of cross-sectional shapes, and/or a variety of dimensions.

[0035] Referring to FIG. 7, a top receiving hole 710 and a bottom receiving hole 712 may be provided prior to stacking of the units. The deformable peg 208 is positioned within one of the top or bottom receiving holes 710, 712. For example, the deformable peg 208 may be positioned with the top receiving hole 712 after the respective unit has been positioned. The top and bottom receiving holes 710, 712 may be sized to provide a frictional fit. This allows for the depth of the receiving holes 710, 712 to be greater than an insertion length of the deformable peg 208. The deformable peg 208 may be position within a receiving hole 710, 712 and lightly hammered or pressed, for example by thumb pressure, into the desired length, for example half way into the top receiving hole 710 allowing the other half to extend above the surface of the block unit to receive the bottom receiving hole 712 on the next successive unit.

[0036] The next successive unit is positioned so that the deformable peg 208 aligns with the bottom receiving hole 712. The top and bottom receiving holes 710, 712 may be constructed in a variety of methods. For example, the receiving holes 710, 712 may be molded or punched in the block unit prior to curing, the receiving holes 710, 712 may be drilled into the block unit on-site, or a combination of construction. For example, the top receiving hole 712 may be punched in the unit prior to curing, and the bottom receiving hole 710 may be drilled. The positioning of the receiving holes 710, 712 may be dependent on the number of pegs per block unit and the wall construction shapes (i.e. 90 degree corner, 45 degree corner, or end of a wall), and other construction aspects.

[0037] Once the unit is maneuvered in place, the unit may be positioned for greater accuracy by tapping the unit with a mallet or other tool. The positioning may be accomplished immediately after place of the unit or after successive layers of units have been positioned. The positioning by tapping the unit causes the deformable peg 208 to bend or deform into a new semi angled shape. The new shape aids in holding the units in a correct position or place until concrete secures the wall permanently. The deformable peg may allow for multiple positioning. For example a unit may be tapped successively throughout the dry stacking process of the wall in order to adjust positioning of the wall. The deformable pegs 208 may be used for corners or other portions of the wall in which additional adjutment may be beneficial.

[0038] The corner unit 204 may not have lugs extending from the top. The corner unit may be used in a straight wall portion, as shown in FIG. 3. The spacing and alignment of lugs, as will be discussed later herein, allows the corner section to be placed within a straight portion of the wall. The lugs of the lower stretcher units 202 extend into the cells of the corner unit 204 without interfering with the side section or the webs of the corner unit.

[0039] FIG. 4A is a top plane view and FIG. 4B is a side profile view of a stretcher unit 400 according to an exemplary embodiment of the invention with webs at non-right angles. The stretcher unit 400 may have a height of eight inches and a length of sixteen inches. The stretcher unit 400 has a front section 402 and a rear section 404. The front section 402 and the rear section 404 may have a thickness of one and a quarter (¼) inches. One or more webs 406 couple the front section 402 to the rear section 404. The webs 406 may have a thickness of one and a half inches (½). The webs 406, according to this embodiment, are symmetrically angled between the front section 402 and the rear section 404. Each web 406 has a pair of lugs 408 extending from the top surface of the web. The lugs 408 may extend above the top surface by ⅛ (¼) inch. The lugs 408 may have a width and thickness of one inch (½). The angled webs 406 allow the stretcher units to be stacked in a staggered fashion without the lugs interfering with the web of a successive layer of stretcher units. The web of the successive layer of stretcher units straddles each pair of lugs 408. The stretcher unit is supported in the lateral direction by a lug positioned between the inner surface of the front or rear section and the web.

[0040] The exemplary embodiments shown in FIGS. 4A and 4B may also include round lugs. The lugs have a round top portion, which aids in the stacking of successive stretcher units. The weight of successive stretcher units pushing down centers the unit into the correct resting position. The rounded lugs help to prevent successive stretcher units from being stuck or partially resting on the lug of lower stretcher units. The exemplary embodiments shown in FIG. 4B may also include a knock-out portion 410 for producing a bonding-beam portion in the constructed wall. The knock-out portion 410 may extend down three inches (¾) from the top surface. The knock-out portion 410 may have a three quarter inch slot to allow for placing reinforcement members or removing the knock-out portion 410. Bonding-beams are horizontal reinforcements in the wall that add strength between the vertical columns of the constructed wall. A row of stretcher units in a wall of individual or successive rows may be designated for a bonding-beam. During construction the knock-out portion 410 may be removed to allow reinforcement members and/or poured concrete to fill the cells of a row of stretcher units. The knock-out portion 410 may be molded into the stretcher unit between the lugs 408 of the web 406.

[0041] The exemplary embodiments shown in FIGS. 4A and 4B may also include chamfered edges on the sides for the front section and the rear section. The chamfer allows the adjacent stretcher unit to fit snugly against the neighboring stretcher unit. The chamfers of neighboring stretcher units overlap providing additional strength and preventing leaking of concrete from the cell columns during pouring. The chamfers may have a 3/8 inch (¼) inset. The exemplary embodiments shown in FIGS. 4A and 4B may also include beveled edges on the outer surface of the front section and the rear section. The beveled edges of the stretcher unit give the wall a more traditional block construction look. The beveled edge outlines the profile of the block without the need for grouted joints. The edge is not limited to a bevel. The edge may have a chamfer or other profile to outline the block face.

[0042] An exemplary embodiment of the invention with webs at right angles is shown in FIG. 5A and FIG. 5B. The
stretcher unit 500 has a front section 502 and a rear section 504. One or more webs 506 couple the front section 502 to the rear section 504. The webs 506, according to this embodiment, run perpendicular between the front section 502 and the rear section 504. The webs 506 may be spaced four inches (+/-) from the end of the stretcher unit 500. To provide cores that line up, each web 506 has a pair of alternating, adjacent lugs 508. The lugs 508 extend above the surface of the stretcher unit 500 and allow the stretcher units to be stacked in a staggered fashion without the lugs 508 interfering with the web of a successive layer of stretcher units.

A first lug of the pair of lugs is coupled against a first surface of a first web and an inner surface of the rear section. A second lug of the pair of lugs is coupled against a second surface of the first web and an inner surface of the front section. A second pair of lugs for the stretcher unit has a first lug of the second pair coupled against a first surface of a second web and an inner surface of the front section. A second lug of the second pair of lugs is coupled against a second surface of the second web and an inner surface of the rear section. Each of the lugs in the first pair of lugs is positioned on alternating sides of the first web. Each lug of the second pair of lugs is also positioned on alternating sides of the second web; however, the lugs are on opposite sides from the first web. This allows the successive layer of stretcher units to rest on the stretcher unit and allows the lugs 508 of the stretcher unit 500 to protrude into the cells of the successive layer of stretcher units without interfering with the lugs of the successive layer of stretcher units.

When the wall is constructed the stretcher units may be staged half way off-center for each successive row. This allows the alternating pairs of lugs to straddle the webs of successive rows of stretcher units. The stretcher unit 500 is supported in the lateral direction by a lug positioned between the inner surface of the front or rear section and the web. The constructed wall locks together by the protruding lugs extending into the cells and straddling the webs of successive rows of stretcher units above and below the stretcher unit.

The stretcher unit 500 may also have a beveled profile on the outer surface of the front section and rear section. The stretcher unit 500 may also have a chamfered side edge for coupling to adjacent units. In addition, the stretcher unit may have a knock-out portion for producing a bonding-beam. These features are similar to those previously described herein with respect to the exemplary embodiment disclosing the exemplary stretcher unit 400 with angled webs.

An exemplary embodiment of the invention with beveled lug profiles is shown in FIGS. 6A, 6B, 6C, and 6D. The exemplary embodiments 600 may include a beveled lug profile 602. The lugs 604 have a beveled surface adjacent to the outer surface of the front section 606 and the rear section 608. The beveled profile aids in the stacking of successive stretcher units. The weight of successive stretcher units pushing down centers the unit into the correct resting position. The beveled lug profiles 602 help to prevent successive stretcher units from becoming stuck or partially resting on the lug of lower stretcher units. In addition to a beveled profile on the surface of the lug facing the outer surface of the front section and the rear section, the lugs may also have a beveled surface adjacent to the web (not shown in Figures). The additional beveled profile aids in stacking and aligning the face shells of the stretcher unit as previously discussed.

All or only a limited portion of top surface 610 of front section 606 and the rear section 608 may be ground to provide a greater degree of accuracy in of the height for the stretcher unit. This greater degree of accuracy may be used to allow for dry stacking the units without the need for shims or leveling supports. The units may be molded using conventional block molding techniques. The grinding is performed after curing. As will be discussed later herein, the lugs 604 may have a recess to provide better alignment. All or only a portion of the top surfaces 610 of the front section 606 and rear section 608 are ground to the desired level. A tolerance of about less than +/-0.015 inches (0.4 mm) may be achieved to provide consistent flat and level surface for precise height for successive stacking of the units. Since the bottom of the unit is typically molded on a flat surface, a consistent and precise block height may be achieved by only grinding the top surface 610.

A corner unit 700 according to an exemplary embodiment of the invention is shown in FIGS. 7A, 7B, and 7C. The corner unit 700 has a front section 702 and a rear section 704. The corner unit 700 also has a side section 706 coupling the front section 702 and the rear section 704. One or more webs 708 couple the front section 702 to the rear section 704. The corner unit 700 may be positioned at the corner of a constructed wall as shown in FIG. 2. The side section 706 provides a uniform appearance at the end of a row of units and provides support for successive rows of units. The corner units may be stacked alternating by 90 degrees for each row. This provides a lacing of rows between two linear portions of the structure. The cell of the corner units 700 may be filled with concrete to lock the corner units 700 together. The corner units 700 may also be ground during the manufacturing process to also provide a consistent level surface for precision height control.

The web 708 is spaced to receive lugs from a previous row of stretcher units offset by half a unit length. The web is spaced within the corner unit so as to align on top of the web of a previous row of stretcher units allowing the lugs of the previous row of stretcher units to straddle the web. The corner unit may also be used in the construction of a linear position of a wall as shown in FIG. 3. The corner unit 700 may also have a beveled or chamfered profile on the outer surface of the front section 702 and rear section 704. The corner unit 700 may also have a chamfered side edge for coupling to adjacent units. In addition, the stretcher unit may have a knock-out portion for producing a bonding-beam. These features are similar to those previously described herein with respect to the exemplary embodiment disclosing the exemplary stretcher unit 400 with angled webs.

The stretcher units may assemble into a linear wall structure 800 as shown in FIGS. 8A and 8B. The linear cells 802 of the stretcher and/or corner units produce a vertical post. The vertical posts typically may be reinforced with a reinforcement member, for example, steel rebar. The linear cells 802 of the stacked stretcher units provide a more consistent size and are aligned linearly. When concrete is poured into the cells the more consistent size of the linear cell makes it less difficult to install reinforcement members in the cores to form the vertical posts. In addition, the more uniform cell dimensions may make it less difficult to fill the voids within the cell. Many conventional dry stack block systems may provide little or no damming capacity when filling the cells of a dry stack block wall structure.

FIG. 9 is a perspective view of the stretcher unit stacked according to an exemplary stacking embodiment 900. The dimensions and structure of the stretcher unit provide the
ability to stack a single column of units. By alternating each successive unit by 180 degrees the next stretcher unit may be stacked on top of a successive unit. The lugs of the stretcher units align in the cells of each successive stretcher unit.

[0052] An exemplary embodiment of the invention includes a beveled or chamfered edge profiles. The beveled edge may extend around the both sides and the top edges of the stretcher unit as previously discussed in FIGS. 6A through 6D. The beveled edge of FIGS. 6A through 6D may about a ¼ inch step. The beveled edges of the stretcher unit give the wall a more traditional block construction look. The beveled edge outlines the profile of the block without the need for grouted joints or may be grouted to provide a more detailed masonry profile look.

[0053] Referring to FIGS. 10A and 10B, the exemplary embodiments may include a chamfered or beveled edge 1010 on one side and the top edges and a flat edge 1012 of the stretcher unit 1000. The chamfered edge 1010 of FIGS. 10A and 10B may about a ¼ of an inch step. This allows the chamfered edge 1010 to butt directly against a flat edge of the next unit. The chamfered edge 1010 mated against the flat edge of the next unit aids in concealing the joint between the two units from the eye. The chamfered edge 1010 outlines the profile of the block and draws the eye away from the joint between units without the need for grouted joints. The chamfered edge 1010 may also be used to provide a tuck point/mechanical gripping for veneer, stucco or grouted lines to provide a more detailed masonry profile look. Positioning the joint to one side of the chamfered edge 1010 may also conceal any future cracks or separation of the tuck point.

[0054] Referring to FIGS. 10B and 10C, a recess 1014 may be provided between the top surface 1009 and lugs 1004. The recess may allow the grinding of the top surface 1009 without the lug 604 interfering with the grinding of the top surface 1009 during the manufacturing process. Interference of the lugs may prevent accurate grinding of the top surface 1004 and/or cause destruction or deformation of the lugs 1004 by the grinder. In addition, the recess 1014 may allow for removal of debris from the grinding process or other manufacture process. Debris that remains on the top surface 1009 may prevent successive units from sitting level on each successive layer. The recess 1014 may be molded to extend about ¼ to ½ an inch below the top surface 1009 and provide a gap of about ¼ to ½ of an inch. The recess 1014 may also be molded to open away from the center of the lug 1004 so that gravity aids in removal of the debris out of the recess 1014.

[0055] Referring to FIGS. 11A, 11B and 11C, multiple levels may be provided on the top surface 1109 of a stretcher unit 1102. Although this feature of the invention will be explained on and in connection with a dry-stack block having a certain configuration and additional features that facilitate and enhance dry stacking, this is not a limitation of this feature of the invention as the stepped top surface profile and use of grout or adhesive describe herein can be performed with any type of block have essentially any configuration and additional features, including but not limited to, a wet-stack block.

[0056] According to an exemplary edge-grinding embodiment of the invention, the top surface 1109 may be divided into regions of varying levels during the molding process. The stretcher unit 1102 may be molded with a central region 1111 having a slightly higher surface than the adjacent top surfaces 1113 which have a lower profile by approximately ¼ inch. After the molding process, the top surface 1109 which may be in the range of 2” to 7” in length (and preferably only about 3” in length) are ground to provide a more accurate height of the stretcher unit 1102.

[0057] The lower surface areas 1113 are molded at a height slightly below the ultimate desired height of the stretcher unit 1102, while the higher surface region 1111 in the central part of the block front and rear sections are molded slightly higher than the desired height of the stretcher unit 1102. Since masonry blocks are typically made from a mixture of concrete, sand and small stones, the ultimate height and "levelness" of each block can and does vary, particularly because of the effects of the small stones which may protrude upwards from the concrete clock. During the grinding process, these height irregularities will be eliminated. The grinder will either not or perhaps barely grind the lower surface 1113 due to the height being just shy of the set grinding height. As the higher surface 1111 passes under the grinder, the grinder removes a portion of the concrete block unit material that exceeds the desired height providing a more accurate stretcher unit 1102 height in view of the molded height. By reducing the amount (length) of the stretcher unit 1102 to be ground down (i.e. a short 3" or so central region 1111), there is improved grinding performance resulting from an increase in the throughput speed as well as reduced wear on the grinding heads.

[0058] For example, when manufacturing an eight-inch high unit, the block may be molded with lower surface 1113 being a one-sixteenth (¼) of an inch shy of eight inches and a higher surface 1111 being a one-sixteenth (¼) of an inch above eight inches. During the grinding process, the grinder may remove portions of the higher surface 1111 providing a height that is eight (8) inches to a greater degree of an eightieth (¼) or less of an inch accuracy. This accuracy allows for good overall height control of the wall and levelness without block “rocking” which is normally not a problem in a mortared wall since the mortar takes up any unevenness in the blocks.

[0059] The precision ground block units provide for precision height control even when mortared together. The design provides for lower surfaces 1113 and a higher surface 1111, which reduces the amount of influence the mortar has on adding height to the courses of the wall. The higher surface 1111 may further have an appropriate number of indentations (grooves or channels) 1115 that serve to reduce the mortar influence in height control to almost zero by providing channels or grooves into which any adhesive, grout or thin mortar may flow. Any great, adhesive or this mortar in the grooves or indentations 1115 will still serve to adhere the top surface of this block with the bottom region of a block placed on top of the block. This higher surface 1111 is then ground to the desired height to provide units of precision height. The geometry of the higher and lower surfaces 1111, 1113 and the indent 1115 in the top surface 1109 are designed in such a way as to provide a self-leveling aspect to the wall construction. The self-leveling feature allows for high stacking productivity even if the field conditions are not perfect. The self-leveling provides for a near fool-proof solution that allows the construction of the concrete block wall to be more forgiving. As an example, if foreign materials are present in one level of the stacking, as subsequent courses are stacked, there is little or no potential for “rocking” of a block. The precision ground region of the higher surface 1111 located in the top surface 1109 of the block’s face will implement the self-leveling feature and allow for an instant remedy to blocks
that would otherwise be crooked or at an angle. The problem of angled or crooked blocks can be remedied immediately without the need for shims or gridding.

[0060] The edge-grinding embodiment is not limited to the lower surface 1113 being lower than the desired height. The lower surface 1113 may be molded to the exact height of the desired stretcher unit 1102. In this example additional grinding may be required with the bulk of the grinding occurring on the higher surface 1111. Additionally, the edge-grinding embodiment may have different lengths of higher surfaces 1111 and lower surfaces 1113. In the example shown in FIGS. 11A and 11B, each surface is roughly divided into thirds; however, the invention if not limited to this exemplary width and ratio. The higher surface 1111 may be greater or less than a third of the overall length of the cement block. In addition to grinding certain predetermined regions of the front and rear top portion of the blocks, certain end portion, such as end portion 1315, FIG. 13B on corner block unit 1304, may also be ground to assist in providing a wall construction of uniform height.

[0061] In the previously discussed embodiment, a top web surface 1106 is molded to a height of the lower surface 1113. This allows the grinding process to avoid the lugs and/or to facilitate multiple grinding processes. However, the embodiment is not limited to the top web surface 1106 being molded to a height of the lower surface 1113.

[0062] After manufacturing of the stretcher units 1102, the stretcher units 1102 may be assembled as previously discussed herein. In the preferred embodiment of the method of the present invention, an adhesive (also termed grout or thin mortar) is applied between each course of the stretcher units 1102. The adhesive may be squeezed from the areas between the higher surface 1111 and the bottom of the next course of units. The adhesive may also remain in areas between the lower surface 1113 and the bottom of the next course of units. Once the adhesive cures, the adhesive may provide additional load-bearing support that typically meets or exceeds code specifications. The adhesive may be an expandable adhesive to aid in the filling of voids between surfaces. The adhesive in this case is selected to provide a desired expansion force that prevents movement of the stretcher unit 1102 after proper positioning while expanding to fill any voids or spaces between surfaces of blocks stacked on top of the other.

[0063] An exemplary code compliant mortar/grout/adhesive according to one feature of the present invention was designed and developed to be applied without a trowel but rather, using a high-speed applicator. Examples of such a high-speed applicator include a grout bag or a grout pump well known in the industry for applying grout to tiles or to the exterior face of previously erected block walls. The stackable block design of the present invention allows for the new mortar to be easily squeezed between the subsequent blocks to a thickness of less than ⅛ of an inch so that the mortar is not dictating the height of the wall. Rather, the height of the wall is dictated by the high-speed grinding height gauging process that each block passes through to make it a precision height unit with tolerances that are an order of magnitude better than in the ASTM C-90 block standard. Fine grained thin set mortar readily available in general home building supply stores like that used for laying tile on floors or walls will work well with the present invention.

[0064] The mortar may also be provided that has properties that conform to the Masonry Standard for Unit Mortared Masonry but is also designed so that it can be applied at high speeds without a trowel or experienced applicator and applied so that it does not interfere with the height control aspects of the precision block of the invention. Such a code approved mortar can be applied at a thickness as thin as ⅛ of an inch. The mortar is ultra fine grained and made with cements, aggregates and chemical modifiers as in thin set motors that give it its unique properties. The particles in the mortar are less than 1/1000 of an inch. The mortar should have good water retention and does not dry out through evaporation or through suction from the dry block to which it is applied. The water retention of the mortar allows the mortar to remain flowable after application to the block allowing all unnecessary motor to flow or squeeze out from between two blocks. If the mortar where to lose its ability to flow, the mortar would add too much thickness between the blocks and would affect the ability of the wall to be built to meet specified elevations.

[0065] Referring to FIGS. 12A and 12B, multiple levels may be provided on the top surface 1209 of a stretcher unit 1202. According to a second exemplary edge-grinding embodiment, the top surface 1209 may be divided into regions of undulating levels during the molding process. The stretcher unit 1202 may be molded with a curved top surface 1209 that has a higher surface 1211 sloping down to the adjacent top lower surfaces 1213. After the molding process the top surface 1209 may be ground to provide a more accurate height of the stretcher unit 1202 as previously described with regard to the embodiments in FIGS. 11A and 11B. Other embodiments of previously described in FIGS. 11A and 11B may also be incorporated in the embodiments of FIGS. 12A and 12B.

[0066] Referring to FIGS. 13A and 13B, multiple levels may be provided on the top surface 1309 of a corner unit 1304. According to an exemplary edge-grinding embodiment, the top surface 1309 may be divided into regions of varying levels during the molding process. The corner unit 1304 may be molded with a top surface 1309 that has a higher surface 1311 slightly higher than adjacent top lower surfaces 1213. After the molding process, the top surface 1311 may be ground to provide a more accurate height of the corner unit 1304 as previously described with regard to embodiments in FIGS. 11A and 11B. Other embodiments of previously described in FIGS. 11A and 11B may also be incorporated in the embodiments of FIGS. 13A and 13B.

[0067] Modifications may be made to fit particular operating requirements and environments as will be apparent to those skilled in the art, the invention is not considered limited to the examples chosen for purposes of disclosure, and covers all changes and modifications which do not constitute departures from the true spirit and scope of the present invention. Modifications and substitutions by one of ordinary skill in the art are considered to be within the scope of the present invention.

1. A method of producing a stackable building block for constructing a masonry wall, the method comprising the acts of:

molding a concrete block having a front section coupled to and substantially parallel with a rear section, each of the front and rear sections having a bottom surface and a top surface, wherein the top surface on both the front and rear sections includes a central region having a height which is greater than first and second end regions located on either side of the central region; and

grinding the central region of the top surface of the front and rear block sections to a predetermined height.
2. The method of producing a stackable building block for constructing a masonry wall of claim 1, wherein the building block is a dry stackable concrete block.

3. The method of producing a stackable building block for constructing a masonry wall of claim 1, wherein the building block is a wet stackable concrete block.

4. The method of producing a stackable building block for constructing a masonry wall of claim 1, wherein the building block is a precision square stackable building block.

5. The method of producing a stackable building block wall utilizing the stackable building block of claim 1, wherein the central region has an undulating surface.

6. The method of producing a stackable building block wall utilizing the stackable building block of claim 1, wherein the central region is a chamfered stackable building block.

7. The method of producing a stackable building block wall utilizing the stackable building block of claim 1, wherein the central region is a beveled stackable building block.

8. The method of producing a stackable building block for constructing a masonry wall of claim 1 wherein the grinding of the higher surface of the top surface is precision ground to provide a stack building block of a specific precision height.

9. The method of producing a stackable building block for constructing a masonry wall of claim 1 wherein the central region of the top surface further includes a plurality of indents or serrations or channels.

10. The method of producing a stackable building block wall utilizing the stackable building block of claim 9, and further comprising the acts of:

   applying a flowable, thin set mortar onto the top surface of the stackable building block using a high speed applicator; and

   allowing the mortar to enter the plurality of indents or serrations or channels on the central region of the top surface, wherein the addition of the mortar does not significantly increase the specific precision height of the stackable building block.

11. The method of producing a stacked building block wall utilizing the stackable building block of claim 1, and further comprising the acts of:

   stacking a second duplicate stack block staged halfway off-center; and

   stacking a third duplicate stack block staged halfway off-center in a direction opposite and adjacent to the second stack block.

12. The method of producing a stack building block for constructing a masonry wall of claim 1 wherein the stack building block has a chamfered or beveled edge on one more exterior edges of the building block.

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