



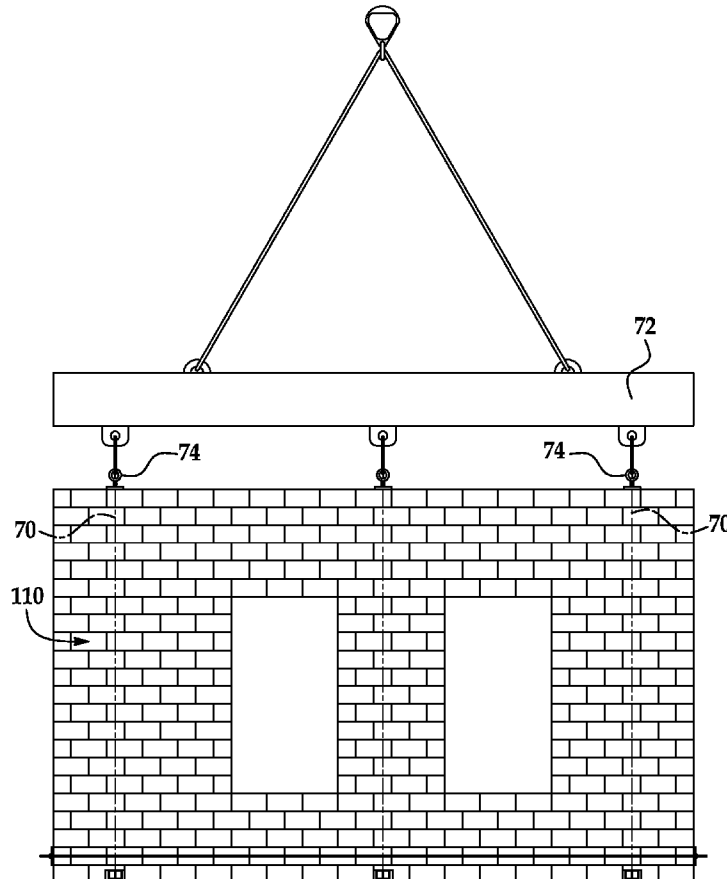
US 20130205688A1

(19) **United States**(12) **Patent Application Publication**
Muirhead et al.(10) **Pub. No.: US 2013/0205688 A1**(43) **Pub. Date: Aug. 15, 2013**(54) **PREFABRICATED COMPOUND MASONRY
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MI (US)(21) Appl. No.: **13/846,470**(22) Filed: **Mar. 18, 2013****Related U.S. Application Data**(63) Continuation-in-part of application No. 13/307,704,
filed on Nov. 30, 2011, which is a continuation of
application No. 13/274,502, filed on Oct. 17, 2011,
now abandoned.(60) Provisional application No. 61/439,863, filed on Feb.
5, 2011, provisional application No. 61/393,599, filed
on Oct. 15, 2010.**Publication Classification**(51) **Int. Cl.****E04B 2/44** (2006.01)**E04G 21/14** (2006.01)**E04B 1/04** (2006.01)(52) **U.S. Cl.**CPC ... **E04B 2/44** (2013.01); **E04B 1/04** (2013.01);
E04G 21/14 (2013.01)USPC **52/122.1**; 52/143; 52/745.2

(57)

ABSTRACT

Embodiments of prefabricated compound masonry units in lieu of build site-constructed elements are provided, as well as methods of producing the same. One embodiment comprises a first course comprising hollow blocks laid end to end with adjacent ends adhered with mortar, the hollow blocks positioned such that the first course has a hollow core; at least one channel formed in a top surface of the first course, the channel having a length; and provisional reinforcement provided along at least a portion of the length of the channel and held within the channel with a bonding material different from the mortar. The provisional reinforcement provides tensile strength to the first course for transportation and handling of the first course from a fabrication location to a build location where the first course is configured to receive permanent structural masonry reinforcement in the hollow core at the build location.



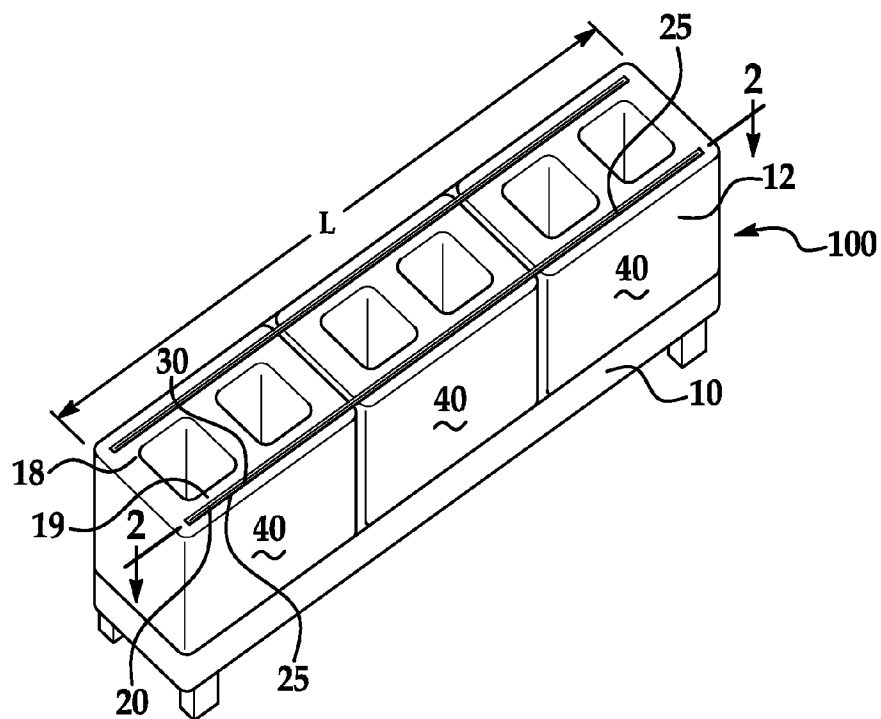


FIG. 1

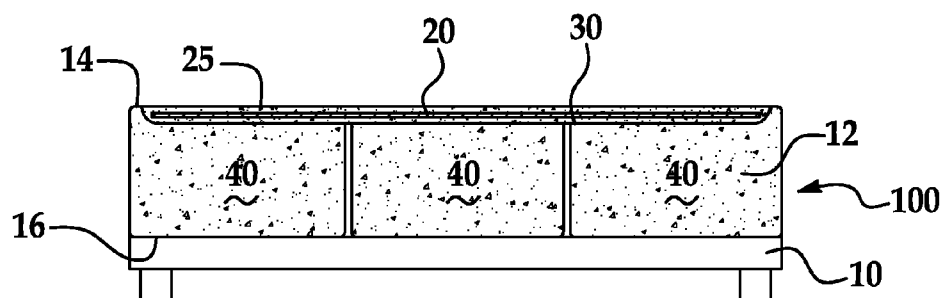


FIG. 2

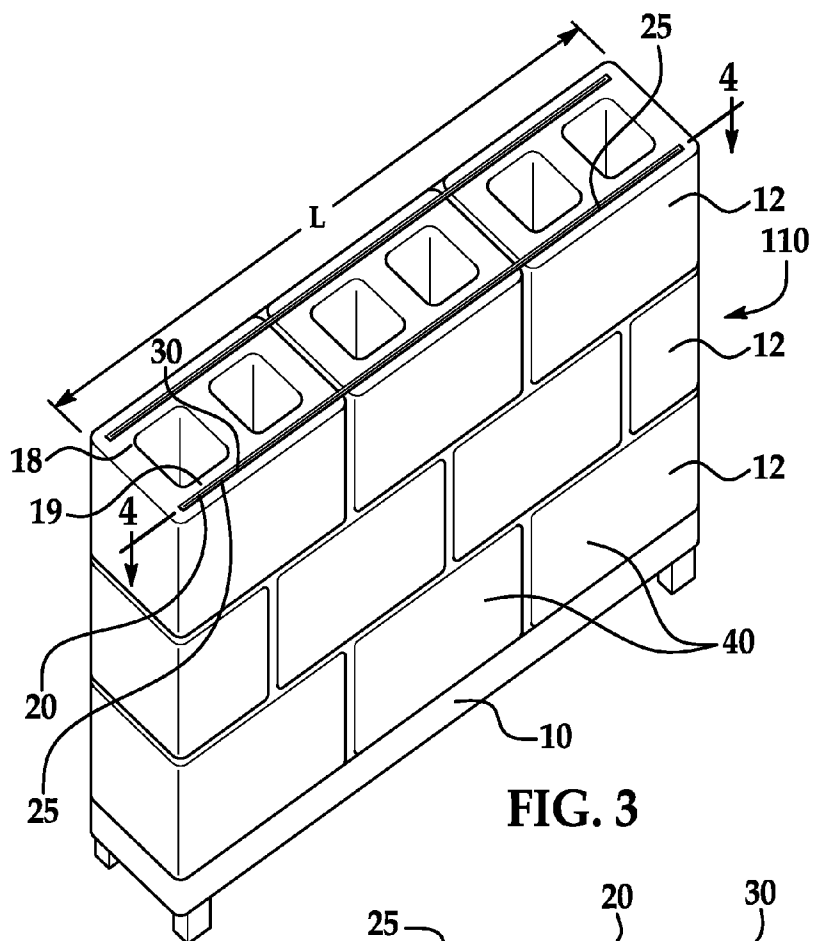


FIG. 3

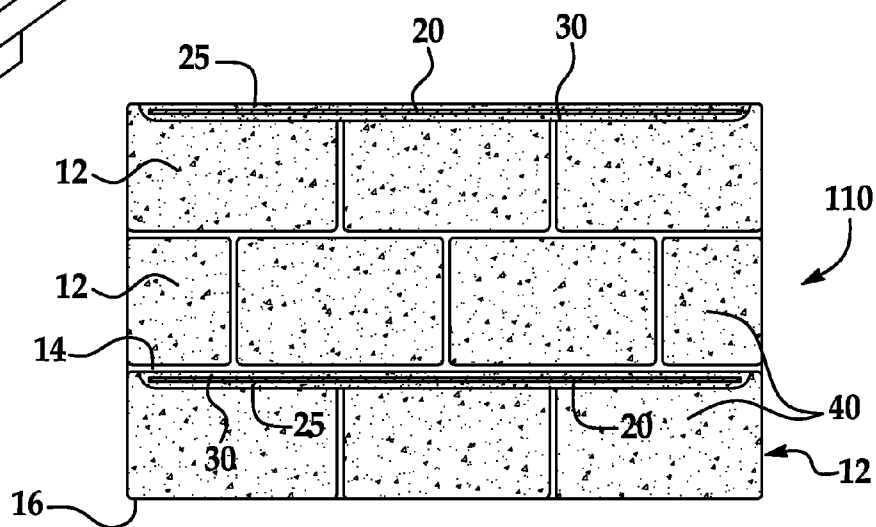


FIG. 4

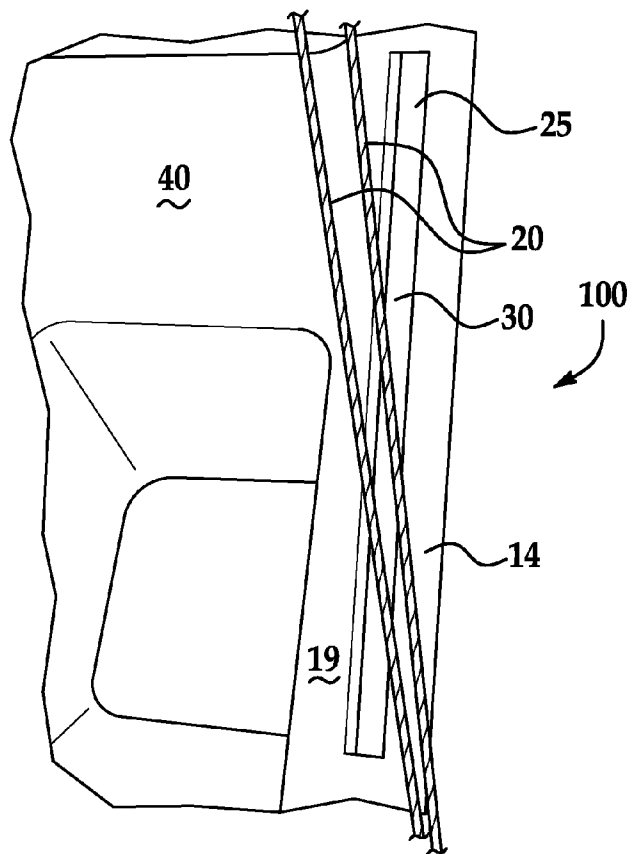


FIG. 5

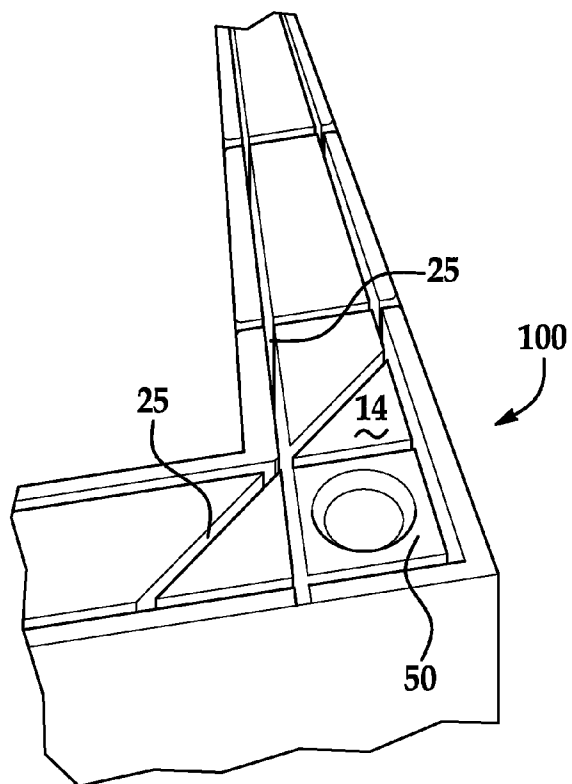


FIG. 6

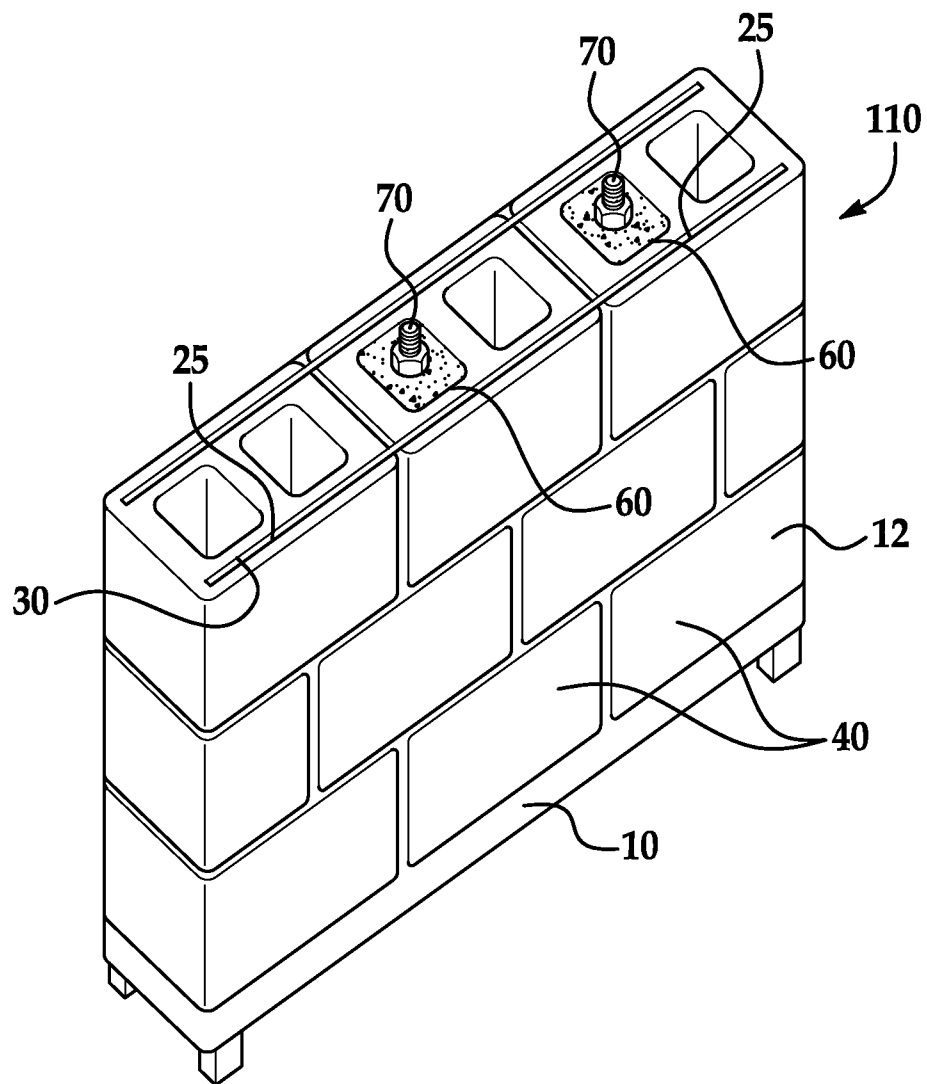


FIG. 7

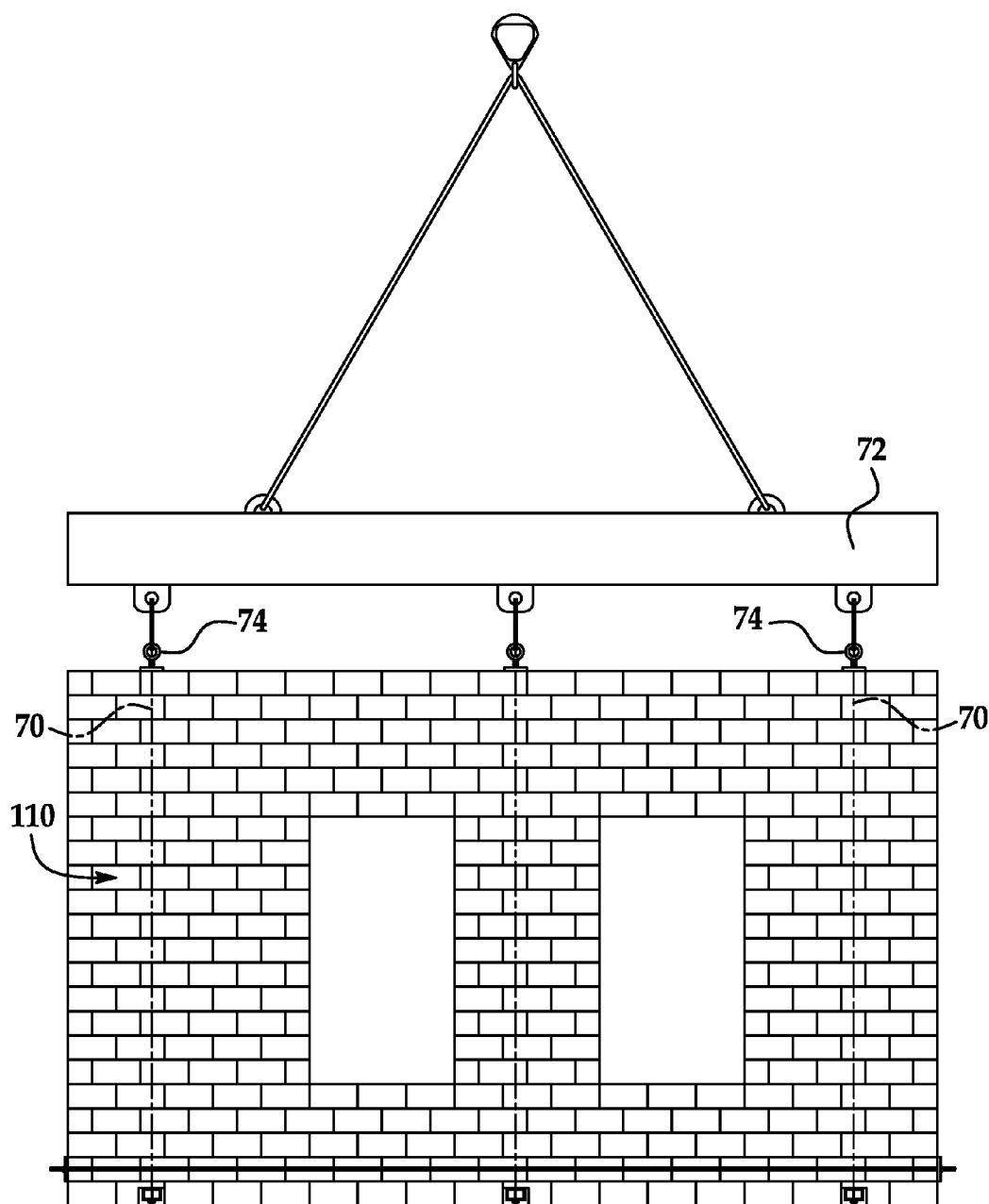


FIG. 8A

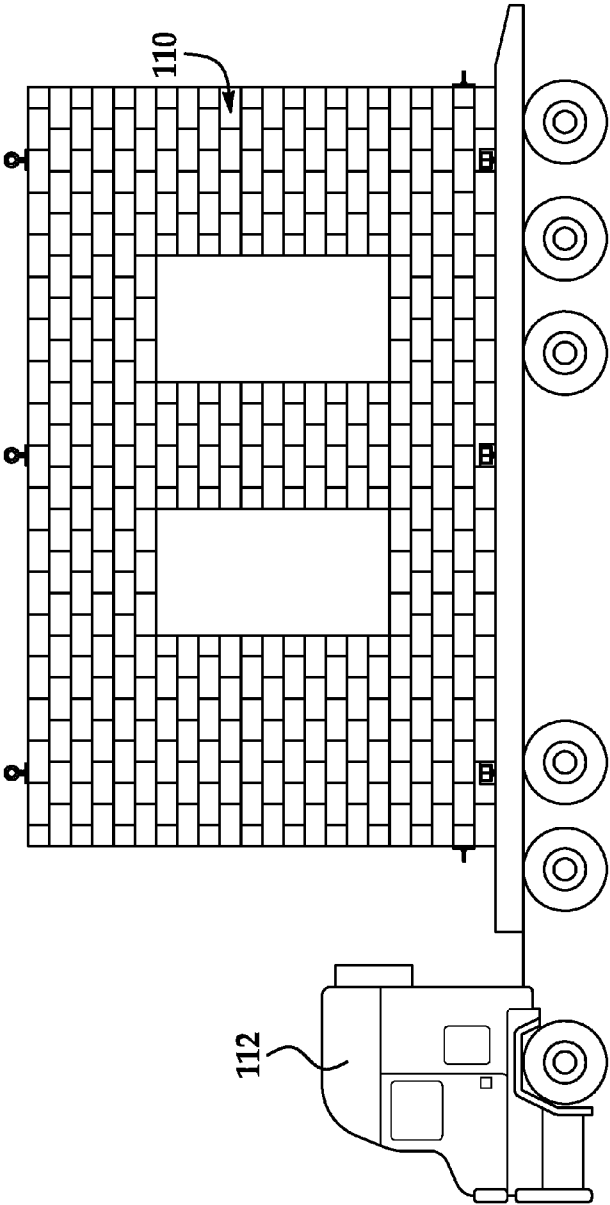


FIG. 8B

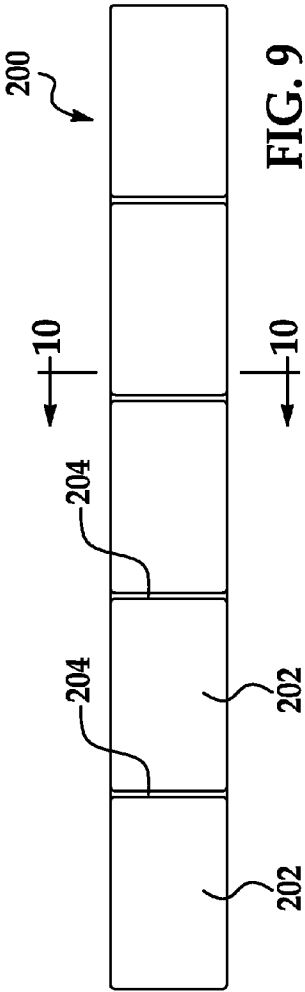


FIG. 9

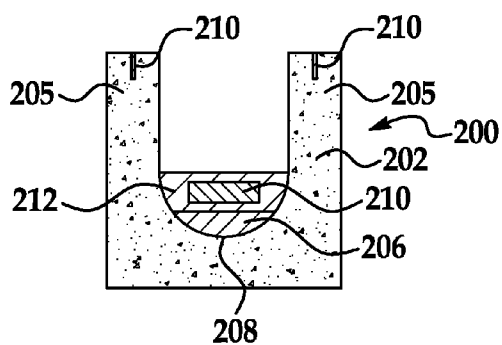


FIG. 10

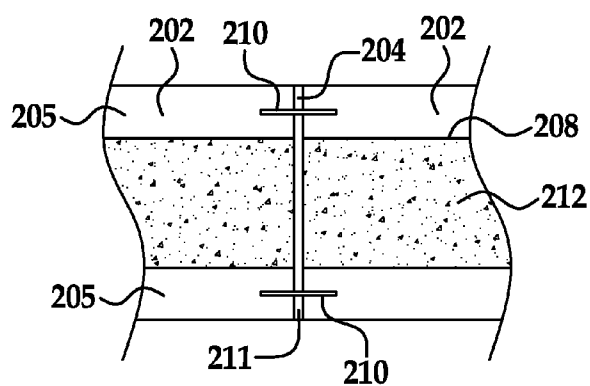


FIG. 11

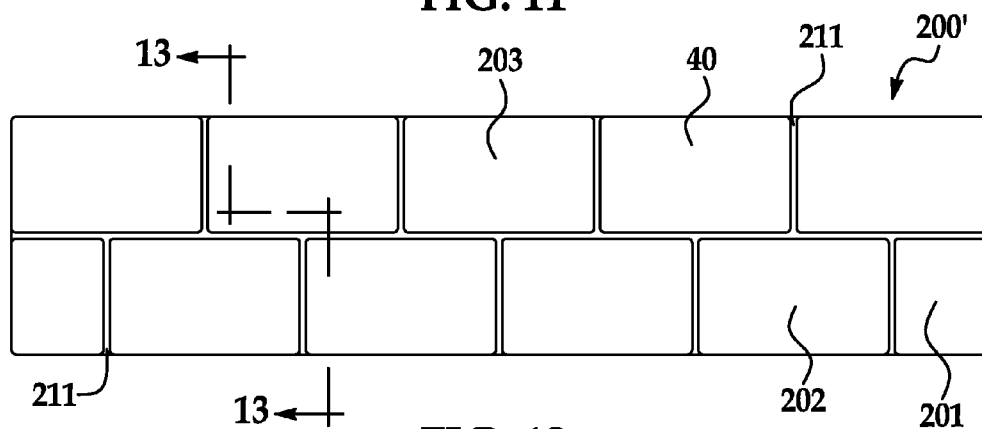


FIG. 12

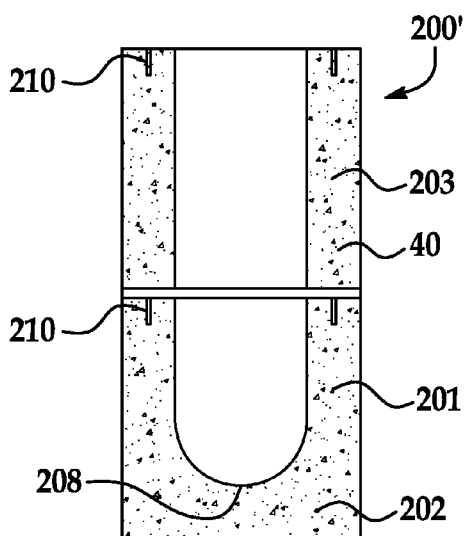


FIG. 13

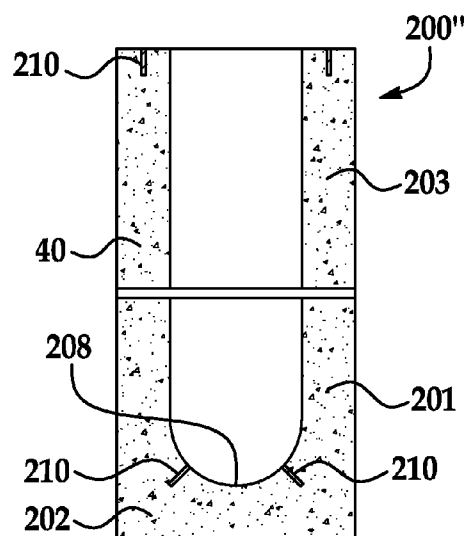


FIG. 14

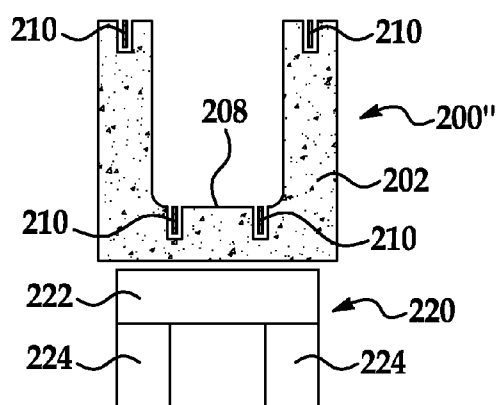


FIG. 15

PREFABRICATED COMPOUND MASONRY UNITS

CROSS REFERENCE TO RELATED APPLICATIONS

[0001] This application is a continuation-in-part of U.S. patent application Ser. No. 13/307,704 filed on Nov. 30, 2011, which is a continuation application of U.S. patent application Ser. No. 13/274,502 filed on Oct. 17, 2011, which claims priority to U.S. Provisional Patent Application Ser. No. 61/393,599 filed on Oct. 15, 2010 and U.S. Provisional Patent Application Ser. No. 61/439,863 filed on Feb. 5, 2011, all of which are incorporated herein in their entirety.

FIELD OF THE INVENTION

[0002] The present invention relates in general to reinforced prefabricated compound masonry units and in particular to compound units reinforced with fiber reinforced polymer.

BACKGROUND

[0003] Structures, including residential, commercial and industrial buildings, are made from masonry using individual masonry blocks laid and bound together by mortar. The common materials of masonry construction are clay masonry such as brick and terra cotta; stone, such as marble, granite, travertine, and limestone; concrete block, including without limitation conventional concrete masonry units and autoclaved aerated concrete blocks; glass block; stucco; and tile. Masonry is generally a highly durable form of construction. However, the materials used, the quality of the mortar and workmanship, and the pattern in which the blocks are assembled can significantly affect the durability of the overall masonry construction.

[0004] Concrete masonry is a commonly used building material composed of individual blocks whose basic composition is concrete. The blocks can be hollow or solid. Concrete is strong in compression and weak in tension. For concrete that is cast at the building site, adding embedded reinforcement during pouring can provide tensile capacity. Reinforcement is not used in individual concrete masonry blocks, but masonry blocks constructed of hollow units require reinforcement at the build site to comply with building codes, and therefore receive the reinforcement at the build site as pluralities of blocks are mortared into units.

[0005] Masonry grout is similar to concrete and is poured into the hollow concrete masonry units at the build site to hold the code required reinforcement. Concrete, concrete masonry blocks, mortar, and masonry grout all contain Portland cement. Care needs to be taken to properly cure the grout and achieve the required strength. However, proper curing can be a challenge as typical build sites are outdoor areas subjected to environmental conditions that are different depending on the location and time of year.

[0006] Currently, individual masonry blocks are transported to the build site where they are laid and mortared into courses, with code required reinforcement installed as and after the courses are laid. To build a structure over about five feet in height, scaffolding is usually necessary to support the masons while they work. Weather can affect the progress of the masonry when laid on site as well.

SUMMARY

[0007] Disclosed herein are embodiments of prefabricated compound masonry units or elements in lieu of build site-constructed elements, and methods of producing the same. One embodiment of a prefabricated compound masonry unit comprises a first course comprising a plurality of hollow blocks laid end to end with adjacent ends adhered with mortar, the plurality of hollow blocks positioned such that the first course has a hollow core; at least one channel formed in a top surface of the first course, the channel having a length; and provisional reinforcement provided along at least a portion of the length of the channel and held within the channel with a bonding material different from the mortar. The provisional reinforcement provides tensile strength to the first course for transportation and handling of the first course from a fabrication location to a build location where the first course is configured to receive permanent structural masonry reinforcement in the hollow core at the build location.

[0008] Another embodiment of a prefabricated compound masonry unit comprises a first course comprising a plurality of U-shaped blocks each having a bed extending between two side walls, the plurality of U-shaped blocks laid end to end with adjacent ends adhered with mortar and positioned to form a continuous bed along a length of the first course; and provisional reinforcement provided along at least a portion of the continuous bed of the first course and held with a bonding material different from the mortar, wherein the provisional reinforcement provides tensile strength to the first course for transportation and handling of the first course from a fabrication location to a build location where the first course is configured to receive permanent structural masonry reinforcement in a cavity defined by the continuous bed and side walls at a build location.

[0009] Also disclosed herein are methods of making a prefabricated compound masonry unit prior to transporting the unit to a building site. One such method comprises: (a) forming a first course from a plurality of hollow blocks by joining ends of adjacent blocks with mortar, the plurality of hollow blocks positioned such that the first course has a hollow core; (b) forming at least one channel in a top surface of the first course, the at least one channel having a length; (c) placing provisional reinforcement along at least a portion of the length of the at least one channel; and (d) retaining the provisional reinforcement within the at least one channel of the first course with a bonding material different from the mortar, wherein (a)-(d) are performed at a fabrication location and the provisional reinforcement provides tensile strength to the first course for transportation and handling of the first course from the fabrication location to a build location, the hollow core of the first course configured to receive permanent structural masonry reinforcement at the build location.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010] The description herein makes reference to the accompanying drawings wherein like reference numerals refer to like parts throughout the several views, and wherein:

[0011] FIG. 1 is a perspective view of an embodiment of a prefabricated compound masonry unit;

[0012] FIG. 2 is a cross sectional view of FIG. 1 along line 2-2;

[0013] FIG. 3 is a perspective view of another embodiment of a prefabricated compound masonry unit;

[0014] FIG. 4 is a cross sectional view of FIG. 3 along line 4-4;

[0015] FIG. 5 is an enlarged perspective view of a portion of FIG. 1;

[0016] FIG. 6 is an enlarged perspective view of an uncompleted prefabricated compound masonry unit having a corner;

[0017] FIG. 7 is a perspective view of an embodiment of a prefabricated compound masonry unit at a fabrication site with post-tensioning rods added at the fabrication site;

[0018] FIG. 8A is a schematic view of a prefabricated compound masonry unit being hoisted with a lifting beam;

[0019] FIG. 8B is a side view of a prefabricated compound masonry unit loaded on a means of transportation to a build site;

[0020] FIG. 9 is a side view of another embodiment of a compound masonry unit as disclosed herein;

[0021] FIG. 10 is a cross sectional view of FIG. 9 along line 10-10;

[0022] FIG. 11 is a plan view of FIG. 9;

[0023] FIG. 12 is a side view of another embodiment of a compound masonry unit as disclosed herein;

[0024] FIG. 13 is a cross sectional view of FIG. 11 along line 13-13;

[0025] FIG. 14 is a cross sectional view of an alternative embodiment of FIG. 12; and

[0026] FIG. 15 is a cross sectional view of another embodiment of a compound masonry unit as disclosed herein with a reusable carrier.

DETAILED DESCRIPTION

[0027] The concept of prefabricated compound masonry units reinforced with fiber reinforced polymer (hereinafter “frp”) includes individual concrete masonry blocks combined into elements (walls, beams, lintels or other masonry elements) at a fabrication site and reinforced with provisional reinforcement of frp at the fabrication site to provide structural support so that the prefabricated units can be transported to the build site and there incorporated into a building structure. The frp provides tensile strength to the units so that they can be transported, handled and installed at the build site. Once installed, the prefabricated units receive the code required reinforcement.

[0028] The prefabricated compound masonry units are provided hollow and without complete reinforcement. They have a provisional reinforcement of frp to facilitate lifting, handling, transport, delivery, and erection. The frp is not intended to replace the grouted steel reinforcement that is necessary to install at the build site to meet code requirements.

[0029] Prefabricated compound masonry units are disclosed herein that are built at a fabrication site and transported to a build site where the units are incorporated into the structure being built at the build site. As used herein, “unit” and “compound unit” refer to the use of two or more individual blocks combined to prefabricate elements at the fabrication site. A block can be clay masonry, such as brick and terra cotta; stone, such as marble, granite, travertine, and limestone; concrete block, including without limitation conventional concrete masonry units and autoclaved aerated concrete block; glass block; stucco; and tile. Compound masonry units can comprise a plurality of these blocks with one or more layers each of frp, epoxy or high strength mortar. As used herein “build site” is the location where a structure is being installed and where the prefabricated compound

masonry units are assembled into the structure and further supported to meet building code requirements.

[0030] As used herein “fabrication site” refers to a site that is typically enclosed and that is a location removed from the building site. The prefabricated compound masonry units are built at the fabrication site and transported from there to the build site. The fabrication site is a controlled factory setting using the fabrications methods disclosed herein to produce prefabricated compound masonry units that can be easily and safely transported and easily integrated into field building applications. This procedure would use craftsmen currently trained in the discipline of masonry and schooled in the new methods disclosed herein of incorporating provisional frp reinforcement for strategic advantages of strength during transportation and handling. Process monitoring of the build would produce design compliance, assuring the ability of the units to meet strict code conformance with product quality regardless of the weather and the natural environment.

[0031] The prefabricated compound masonry units have many advantages over using individual blocks assembled at the build site or concrete poured at the build site. The prefabricated compound masonry units are adaptable for add-ons for last minute owner requirements. The prefabricated compound masonry units are built using the existing contingent of building trades. Use of the prefabricated compound masonry units can eliminate work stoppage due to weather conditions and lessen site damage of the individual blocks and other components. The use of prefabricated compound masonry units can also lessen occurrences of theft of product from unguarded build sites as the compound masonry units are too large to be easily transported without the proper assist and truck. The use of the prefabricated compound masonry units can provide “ease of building” on tight or busy sites and also provide safe, dust free construction solutions.

[0032] The prefabricated compound masonry units limit moisture-related shrinkage issues as the mortar will cure properly at the fabrication site and can be produced with consistent quality. Prefabricated units are manufactured in a weather-protected, controlled-temperature environment of between 60° F. and 85° F., so cold-weather protection, hot weather protection, and wind protection for masonry are not required. Cement-based materials require a moist, controlled environment to gain strength and harden fully. The cement paste hardens over time, initially setting and becoming rigid and gaining in strength in the days and weeks following. Hydration and hardening during the first three days can be critical. Fast drying and shrinkage due to factors such as evaporation may lead to increased tensile stresses at a time when the material has not yet gained significant strength, resulting in greater shrinkage cracking. During the curing period, it is preferable to maintain conditions with a controlled temperature and humid atmosphere. Properly curing concrete leads to increased strength and lower permeability, and avoids cracking from the surface drying out prematurely. Care must also be taken to avoid freezing or overheating. Improper curing can cause scaling, reduced strength, poor abrasion resistance and cracking. The methods herein address these concerns.

[0033] These advantages are provided as examples and are not meant to be limiting. Those skilled in the art will recognize these advantages and more associated with the prefabricated compound masonry units and their use.

[0034] The prefabricated compound masonry units can be made to any overall shape and size desired or required by

those skilled in the art so long as the units can be transported. Examples of applications for which the use of the prefabricated compound masonry units is contemplated include but are not limited to the following: columns, decorative walls, corners, floors, roofs, footings “neat” or insulated, headers for doors and windows, lintels, beams, posts, key walls, knee walls, ledges, retaining walls, wall sections, wall sections with returns, gable ends, arches, piers and walkways.

[0035] The prefabricated compound masonry units can be built on a build base **10** as seen in FIG. 1. The build base **10** is shown near but slightly raised off the ground; however, the build base **10** can be raised to any level for the comfort of the builder. However, the build base **10** does not need to be raised off the ground. The build base **10** is leveled so that the resulting prefabricated compound masonry unit **100** built on the base **10** is level. The building materials can be laid directly on the build base **10** or a base cover can be used to cover the build base **10** to prevent build up of building materials such as epoxy and mortar on the build base **10**.

[0036] One embodiment of a prefabricated compound masonry unit is illustrated in FIGS. 1 and 2 and comprises at least one course **12** comprising a plurality of blocks **40** mortared together. The course **12** has a top surface **14** and a bottom surface **16** each having a first side **18** and a second side **19**. Provisional reinforcement **20** is provided along at least a portion of a length **L** of the course **12** and held with bonding material **30**. As used herein, “provisional reinforcement” refers to the frp that is included in the units to provide the requisite support for transportation, handling, delivery and placing the unit to and at the build site. The provisional reinforcement may continue to provide some structural reinforcement after it is incorporated at the build site; however, the provisional reinforcement does not meet current code requirements for permanent reinforcement. Therefore, horizontal and/or vertical reinforcement as required by code must be added at the build site.

[0037] The bonding material **30** used to retain the provisional reinforcement **20** can be, as non-limiting examples, a high strength mortar that is a polymer modified, shrinkage compensated, rapid setting high strength, hydraulic cement-based mortar or an epoxy or epoxy grout. Similar materials known to those skilled in the art are also contemplated. The bonding material **30** is to be distinguished from adhesive material such as mortar typically used to adhere blocks to one another in masonry or grout used in other applications. Ordinary mortar or grout would not suffice for holding the provisional reinforcement **20** to the course **12** during transportation, handling, etc. of the prefabricated unit. Additionally, it would not be feasible to simply substitute the bonding material **30** used to retain the provisional reinforcement for traditional or ordinary mortar between blocks, as the bonding material **30** would be prohibitively expensive and lack the viscosity to hold together the blocks of the units in the same way mortar does.

[0038] Provisional reinforcement **20** is frp and includes, as non-limiting examples, carbon fibers or aramid fibers which are set in the bonding material. The provisional reinforcement can come in different forms. For example, the provisional reinforcement can come in plate form. The plate is a somewhat stiff yet still flexible sheet, i.e., it will spring back after it is flexed. The plate is cut into strips for use as the provisional reinforcement. As another example, the provisional reinforcement can come in the form of toes. The toes come laced together (by Kevlar or nylon) into arrays, so that the array is

one toe wide and more than one toe deep. The arrays are cut to the number of toes needed for a particular application. The toes themselves are flexible and are approximately $\frac{1}{8}$ inch in diameter. The arrays of toes come coiled in rolls. Provisional reinforcement **20** has limited stretch, thereby providing the reinforcement required when the prefabricated compound masonry unit **100** is lifted, transported, etc. The amount and configuration of the provisional reinforcement will change depending on one or more of the dimensions, weight, lifting configuration and application of the resulting prefabricated compound masonry unit **100**. Other embodiments of the provisional reinforcement **20** are contemplated. For example, the provisional reinforcement **20** can be mesh or shaped frp. The shapes can include, as non-limiting examples, dowels, biscuits and other joinery known to those skilled in the art. The dowels or biscuits can be placed along joints of adjacent blocks **40** in the channels **25** if provided, in existing openings in the individual units or in apertures cut into the individual units specifically to receive the shaped frp. The type and shape of frp used can depend on the type of hollow block used.

[0039] As seen in FIGS. 1 and 2, the provisional reinforcement **20** can be located in channels **25** that can be cut into or molded into the individual blocks **40** or courses **12** of such blocks **40**. The channels **25** are sized and configured to receive the provisional reinforcement **20**. Bonding material **30** is applied to the channels **25** and the provisional reinforcement **20** is laid within the bonding material **30** in the channels **25**. Each of the first side **18** and second side **19** of the top surface **14** can have a channel **25** formed therein, with the provisional reinforcement **20** retained within each channel **25** with the bonding material **30**. Any spillover of epoxy outside the channel **25** is removed to ensure contact of the mortar to the block if another course is added over the first course at the fabrication site or at the build site.

[0040] Depending on the type and size of unit required, the course **12** may be made of any number of blocks **40**. Lintels, for example, are typically a single course **12** made up of a plurality of blocks **40**. A prefabricated lintel would typically be transported as a single course. However, the methods herein also include adding one or more courses at the fabrication site depending on the type of unit being made. FIGS. 3 and 4 illustrate a prefabricated compound masonry unit **110** having three courses **12** by means of example only. When the first course is complete with the provisional reinforcement **20** retained within the channels with bonding material **30**, another course can be laid with mortar on top of the first course. One or more additional courses **12** of blocks **40** can be laid and mortared as required to achieve the final dimensions of the prefabricated compound masonry unit **110**. When the number of layers is complete, additional provisional reinforcement **20** is incorporated into the top layer as shown in the figures. Alternatively, when all courses but one are laid and mortared, channels **25** can be provided in the surface of the next to last course within which the bonding material **30** and provisional reinforcement **20** is placed. When the final course is placed on top, the bonding material **30** and provisional reinforcement **20** will be hidden from view to provide an aesthetically finished product.

[0041] It is also contemplated that provisional reinforcement **20** and bonding material **30** can be used between one or more layers as required to assure the prefabricated compound masonry unit **110** has the necessary strength. FIG. 5 is an enlarged view of the channel **25**, bonding material **30** and

provisional reinforcement **20**. FIG. 6 is an enlarged photo of a corner of a prefabricated compound masonry unit **100** made from autoclaved aerated concrete (AAC) blocks. An example is provided of channels **25** formed for provisional reinforcement in a corner. The prefabricated compound masonry unit **100** can have a course **12** with at least one corner **50** and the provisional reinforcement **20** can extend across the corner **50** on one or both of the top surface **14** and the bottom surface **16** of the at least one course.

[0042] As non-limiting examples, the provisional reinforcement **20** can extend along at least a portion of both the first side **18** and the second side **19** of one or both of the bottom surface **16** and top surface **14** of one or more of the courses **12** that form a unit and be held with bonding material **30**. The provisional reinforcement **20** can extend along substantially an entire length *L* of the course **12** or can extend at intervals along the course **12**. The prefabricated compound masonry unit **110** can have a plurality of courses **12** having a lowermost course and an uppermost course with the first side **18** and the second side **19** of the top surface **14** of each of the lowermost course and the uppermost course having the channel **25** formed therein, with the provisional reinforcement **20** retained within each channel **25** with the bonding material **30**.

[0043] The bonding material **30** can be installed in the channels **25** before laying the provisional reinforcement **20** in the channel **25** and/or after laying the provisional reinforcement **20** in the channel. The bonding material **30** is cured as required.

[0044] The prefabricated compound masonry units **100**, **110** are made at the fabrication location in any number of courses to be transportable to a build site without having all of the horizontal and vertical reinforcement that is necessary to meet building code requirements. The provisional reinforcement provided in the units at the fabrication location provides tensile strength (i.e., flexural strength and strength to resist shear) to the units only to enable transportation and handling of the hollow courses to a build site. "Hollow" refers to the fact that not all of the reinforcement required for a code-compliant, completed building has yet been incorporated into the units. Being able to transport the units in a hollow state provides flexibility to construction workers, enabling them to incorporate any number of courses as needed into the structure, such as a single course, also referred to as a lintel. Transporting the courses as "hollow" is unique and significantly reduces the weight of the courses, allowing for lower cost and easier handling. It also permits the steel reinforcement required for a completed building to be installed only when the prefabricated element is incorporated in the structure at the build site. This in turn permits the steel reinforcement to be continuous through the prefabricated element and the structure into which it is incorporated, which offers significant structural (statics) advantages.

[0045] FIG. 7 illustrates the use of vertical post-tensioning rods or bars **70** that have been incorporated into the prefabricated compound masonry unit **110** at the fabrication site by means of example. As shown in FIG. 7, the post-tensioning **70** can be inserted vertically into existing openings in the blocks **40** to span a plurality of courses **12** in the prefabricated compound masonry unit **110**. At the build site, the post-tensioning rods may sometimes be used for permanent vertical reinforcement. If required, the post-tensioning can be grouted in place with grout **60**, which is similar to mortar.

Post-tensioning rods or bars can also be incorporated at the fabrication site horizontally in units made with hollow U shaped blocks.

[0046] FIG. 8A illustrates the lifting of a prefabricated compound masonry unit **110** when the unit **110** has a large number of courses, such as when making a hollow wall. To lift the hollow wall onto a truck, shown in FIG. 8B, a lifting beam **72** is connected to the vertical bars **70** that have been fitted with rings **74** to which the lifting beam **72** is attached. A crane is used to lift the prefabricated compound masonry unit **110** to and from the truck **112** or other means of transportation, with the provisional reinforcement provided by the disclosed embodiments to prevent the unit **110** from cracking. Shoring or bracing (not shown) can be provided to the prefabricated compound masonry unit **110** after it is on the truck for further protection and stabilization during travel. Other means of lifting and moving the units can be used and can be dependent on the size and weight of the unit to be transported.

[0047] FIG. 9 is a side view of another embodiment of a compound masonry unit **200**. As shown in FIG. 9, a single course of U-shaped blocks **202** can be used to make the compound unit **200**. The individual blocks **202** are joined together with mortar **204** to make the course. FIG. 11 is a plan view of a portion of the course.

[0048] FIG. 10 is a cross-sectional view of FIG. 9 along line 10-10. As shown in FIG. 10, the U-shaped block **202** forms a bed **208** running the length of the block **202** between the walls **205** of the block **202**. Therefore, the bed **208** can run the length of the course. In one embodiment, a thin layer **206** of bonding material **30** can be spread in the bed **208** of the unit **200**. The thin layer **206** can be approximately 0.25 inch to 1 inch. This thickness is not meant to be limiting and is provided as example only. Other thicknesses can be used as desired or required. However, increased thickness will increase the weight of the compound unit. Provisional reinforcement **210** is laid on the thin layer **206** of bonding material **30**. Over the frp is placed another layer **212** of bonding material **30** to enclose the frp. The layer **212** can be of the same thickness or a different thickness than the thin layer **206**. The layers **206**, **212** can be the same bonding material **30** or can be different bonding materials, i.e., the thin layer **206** can be epoxy grout and layer **212** can be high strength mortar.

[0049] The layers **206**, **212** of bonding material **30** and provisional reinforcement **210** can run the length of the compound masonry unit **200**. It is also contemplated that at least the provisional reinforcement **210** only be placed in the bed **208** across the joints of individual units **202**. Alternatively, the provisional reinforcement **210** can be laid in multiple sections in any suitable lengths and any suitable interval that provide the requisite strength to the compound masonry unit **200**.

[0050] In another embodiment, provisional reinforcement **210** can be added to the compound unit **200** to bridge the joints **211** between individual blocks **202** at the top of the course, as shown in FIGS. 10 and 11. FIG. 11 is a plan view of a portion of the course that includes the joint **211** filled with mortar **204** between two blocks **202**. As shown in FIG. 10, the provisional reinforcement **210** bridges the joint **211** between the individual blocks **202**. A length of provisional reinforcement **210** is set in slots formed in the top surface of the blocks **202** and set in place with bonding material **230**. FIG. 10 illustrates the use of the provisional reinforcement **210** in the bed **208** and spanning the joints **211**. These embodiments can be combined as shown or can be used individually. The provisional reinforcement **210** in the bed **208** can also be com-

bined with the provisional reinforcement **20** shown in FIGS. 1-4. The course can be put together with the provisional reinforcement **210** in the bridge joints **211**, with the provisional reinforcement **210** in the bed **208** being laid after the course is made. The provisional reinforcement **210** can be installed in strips at each joint or continuous through all joints.

[0051] Another embodiment of the compound unit **200'** is shown in FIGS. 12 and 13. In this embodiment, the compound unit **200'** is shown with two courses **201**, **203** of blocks **202**, **40**. Although the compound unit **200'** is shown having two courses **201**, **203**, it is contemplated that the compound unit **200'** can be made of more than two courses. The bottom course **201** is made of a plurality of U-shaped blocks **202** while the second course **203** is made of a plurality of hollow blocks **40**.

[0052] In this embodiment, provisional reinforcement **210** is added to the compound unit **200'** to bridge the joints **211** between individual blocks **202** at the top of the bottom course **201**, as well as to bridge the joints **211** between individual blocks **40** at the top of the second course **203**. The provisional reinforcement **210** is set in slots with bonding material **30**. As with FIGS. 9-11, using provisional reinforcement **210** to span joints **211** refers to using frp of any length and shape that contacts a portion up to a whole of the length of two adjacent blocks.

[0053] The embodiment of FIG. 13 is shown without any additional reinforcement added to the bed **208**. Alternatively, the provisional reinforcement **210** added to the bed **208** described with regard to FIG. 10 can be incorporated into the compound unit **200'**.

[0054] The layers **206**, **212** of bonding material **30** and provisional reinforcement **210'** can run the length of the unit **200'**. It is also contemplated that at least the provisional reinforcement **210'** only be placed in the bed **208** across the joints of individual units **202'**. Alternatively, the provisional reinforcement **210'** can be laid in multiple sections in any suitable lengths that provide the requisite strength to the compound unit.

[0055] FIG. 14 is another embodiment of a prefabricated compound masonry unit **200"**. This embodiment is the same in many respects as the embodiment in FIG. 13, and thus the overlapping description will not be repeated. As shown in FIG. 14, the provisional reinforcement **210** in the bottom course **201** is inserted in a different position than that in FIG. 13. Rather than bridging the joints **211** of the blocks **202** at the top of the course **201**, the provisional reinforcement **210** bridges the joints **211** between the blocks **202** in two places along the bed **208** of the compound unit **200"**. A length of provisional reinforcement **210** is set in slots in the blocks **202** and set in place with bonding material **30**. FIG. 14 only illustrates two places where the provisional reinforcement **210** spans the joint **211** in the bed **208**. However, this is not meant to be limiting. The provisional reinforcement **210** can be used to bridge the joints **211** in any number of locations along the bed **208** and walls **205** as desired or required. The position of the provisional reinforcement **210** along the bed **208** is also provided by means of example and is not meant to be limiting. The positions can be located as desired or required along the bed **208** and/or wall **205**. The depth of slots in which the provisional reinforcement **210** is retained is also illustrative and not meant to be limiting.

[0056] FIG. 15 is a cross-sectional view of an alternative embodiment of the compound masonry unit **200"** that incor-

porates the provisional reinforcement **210** in the joints **211** between individual blocks **40** to bridge the joints **211** along the top surface as shown in FIG. 14, and incorporates into the same course the provisional reinforcement **210** bridging the joints **211** between the blocks **202** along the bed **208**, also shown in FIG. 14.

[0057] Also illustrated in FIG. 15 is an embodiment of a reusable carrier **220** for the prefabricated compound masonry units disclosed herein. The reusable carrier **220** allows for an alternate method for transportation of prefabricated compound masonry units manufactured as disclosed herein to the build sites. The reusable carrier **220** comprises a support member **222** having two support legs **224** extending from the support member **222** to form an inverted "U" shape. The support member **222** and support legs **224** can be made of lumber.

[0058] As shown in FIG. 15, a prefabricated compound masonry unit **200"** is set on the support member **222** of the reusable carrier **220**. The prefabricated compound masonry unit **200"** would be banded to the carrier **220** in a plurality of positions along their lengths. The slings of a crane would then be placed around the combined unit and the unit moved to the transporter for transportation to the build site. At the build site, the combined unit would be removed in the same way from the transporter. The reusable carrier **220** can be used for a portion of the shoring support as well as shipping. The reusable carrier **220** would be brought back to the fabrication site for reuse.

[0059] In the embodiments described herein, a coating can be applied to the compound masonry units prior to transporting to the build site to provide corrosion protection and abrasion resistance and fills joints. The coating can be, as a non-limiting example, a polymer coating that uses formulations of poly urea with different physical property ranges. A coating can also be used to water proof the compound masonry units as desired or required. One skilled in the art will recognize the various coating that can be used to achieve the desired results.

[0060] While the invention has been described in connection with certain embodiments, it is to be understood that the invention is not to be limited to the disclosed embodiments but, on the contrary, is intended to cover various modifications and equivalent arrangements included within the spirit and scope of the appended claims, which scope is to be accorded the broadest interpretation so as to encompass all such modifications and equivalent structures as are permitted under the law.

What is claimed is:

1. A prefabricated compound masonry unit made at a fabrication site and configured for transportation to a build site comprising:

- a first course comprising a plurality of hollow blocks laid end to end with adjacent ends adhered with mortar, the plurality of hollow blocks positioned such that the first course has a hollow core;
- at least one channel formed in a top surface of the first course, the at least one channel having a length; and
- provisional reinforcement provided along at least a portion of the length of the at least one channel and held within the at least one channel with a bonding material different from the mortar;

wherein the provisional reinforcement provides tensile strength to the first course for transportation and handling of the first course from a fabrication location to a build location where the first course is configured to

receive permanent structural masonry reinforcement in the hollow core at the build location.

2. The prefabricated compound masonry unit of claim 1, wherein the at least one channel is two channels formed in spaced relation on the top surface of the first course with provisional reinforcement provided along at least a portion of the length of each of the two channels and held within the two channels with a bonding material.

3. The prefabricated compound masonry unit of claim 2, wherein the plurality of hollow blocks are a plurality of U-shaped blocks such that the top surface of the course has a first side and a second side, with one of the two channels formed on the first side and another of the two channels formed on the second side.

4. The prefabricated compound masonry unit of claim 1 further comprising one or more additional courses laid in ascending order upon the first course and adhered to adjacent courses with mortar.

5. The prefabricated compound masonry unit of claim 4, wherein a top course comprises:

at least one channel formed in a top surface of the top course, the at least one channel having a length; and provisional reinforcement provided along at least a portion of the length of the at least one channel and held within the at least one channel with bonding material.

6. The prefabricated compound masonry unit of claim 3, wherein the portion of the length that the provisional reinforcement extends is intervals along the length, each interval spanning a joint between adjacent U-shaped blocks.

7. The prefabricated compound masonry unit of claim 6 further comprising one or more additional courses laid in ascending order upon the first course and adhered to adjacent courses with mortar.

8. The prefabricated compound masonry unit of claim 7, wherein a top course comprises:

at least one channel formed in a top surface of the top course, the at least one channel having a length; and provisional reinforcement provided along at least a portion of the length of the at least one channel and held within the at least one channel with bonding material.

9. The prefabricated compound masonry unit of claim 3, wherein the plurality of U-shaped blocks each have a bed between two side walls such that the first course has a bed extending along the length of the first course, and wherein additional provisional reinforcement is provided above a surface of the bed at least along a portion of the length of the bed.

10. The prefabricated compound masonry unit of claim 3, wherein the blocks in the plurality of U-shaped blocks each has a bed between two side walls such that the first course has a bed extending along the length of the first course, and wherein additional provisional reinforcement is provided in one or more slits within ends of adjacent U-shaped blocks such that a joint between adjacent blocks is spanned, the slits formed within the surface of one or both of the bed and the two side walls.

11. The prefabricated compound masonry unit of claim 1, wherein the provisional reinforcement extends along substantially an entire length of the first course.

12. The prefabricated compound masonry unit of claim 1, wherein the provisional reinforcement is fiber reinforced polymer.

13. A prefabricated compound masonry unit comprising:
a first course comprising a plurality of U-shaped blocks each having a bed extending between two side walls, the

plurality of U-shaped blocks laid end to end with adjacent ends adhered with mortar and positioned to form a continuous bed along a length of the first course; and provisional reinforcement provided along at least a portion of the continuous bed of the first course and held with a bonding material different from the mortar,

wherein the provisional reinforcement provides tensile strength to the first course for transportation and handling of the first course from a fabrication location to a build location where the first course is configured to receive permanent structural masonry reinforcement in a cavity defined by the continuous bed and side walls at a build location.

14. The prefabricated compound masonry unit of claim 13, wherein the provisional reinforcement is laid above a surface of the continuous bed along a majority of the length of the continuous bed.

15. The prefabricated compound masonry unit of claim 13, wherein the provisional reinforcement is provided in one or more slits within ends of adjacent U-shaped blocks such that a joint between adjacent blocks is spanned, the slits formed within the surface of one or both of the bed and the two side walls.

16. A method of making a prefabricated compound masonry unit prior to transporting the unit to a build site comprising:

- (a) forming a first course from a plurality of hollow blocks by joining ends of adjacent blocks with mortar, the plurality of hollow blocks positioned such that the first course has a hollow core;
- (b) forming at least one channel in a top surface of the first course, the at least one channel having a length;
- (c) placing provisional reinforcement along at least a portion of the length of the at least one channel; and
- (d) retaining the provisional reinforcement within the at least one channel of the first course with a bonding material different from the mortar, wherein (a)-(d) are performed at a fabrication location and the provisional reinforcement provides tensile strength to the first course for transportation and handling of the first course from the fabrication location to a build location, the hollow core of the first course configured to receive permanent structural masonry reinforcement at the build location.

17. The method of claim 16, wherein the plurality of hollow blocks are U-shaped blocks having two side walls and a bed extending there between, and the at least one channel is two channels, and wherein:

- step (b) comprises forming one of the two channels along a top surface of one of the two side walls and forming another of the two channels along a top surface of another of the two side walls;
- step (c) comprises placing provisional reinforcement in each of the two channels; and
- step (d) comprises retaining the provisional reinforcement within the two channels with the bonding material.

18. The method of claim 16, wherein the first course has a bed extending along the length of the first course, the bed positioned between external walls of the first course, the method further comprising:

- (e) providing bonding material along at least a bottom surface of the bed; and

- (f) placing provisional reinforcement in the bonding material within the bed along at least a portion of the length, wherein (e) and (f) are performed at the fabrication location.

19. The method of claim **16** further comprising:

- (e) forming a second course from a plurality of blocks by joining adjacent blocks with mortar, the second course having a top surface with a first side and a second side and a joint between each pair of adjacent blocks, wherein (e) is performed at the fabrication location and the provisional reinforcement provides tensile strength to the second course sufficient for transportation and handling of the first course and second course from the fabrication location to a build location.

20. The method of claim **16** wherein the first course has a bed extending along the length of the first course, the bed positioned between external walls of the first course, the method further comprising:

- (e) providing slits in adjacent hollow blocks that span joints between the adjacent hollow blocks, the slits located along the bed; and
- (f) placing provisional reinforcement in the slits and retaining the provisional reinforcement in the slits with bonding material, wherein (e) and (f) are performed at the fabrication location.

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