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(54) Title: PLANTER-BRICK, FORM FOR PLANTER-BRICK, AND METHOD OF MAKING PLANTER-BRICK

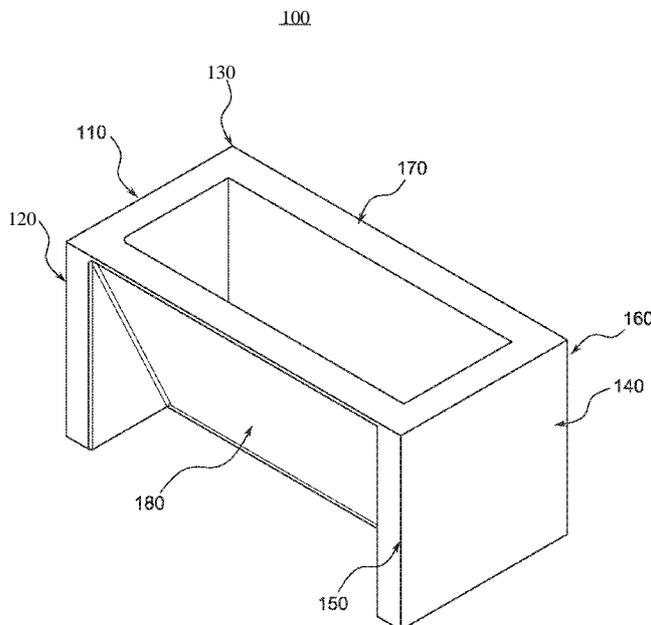


FIG. 1

(57) Abstract: A structural building unit, a form for making a structural building unit, and a method of forming a structure from structural building units are disclosed. A structural building unit comprising left, right, back, and front portions with the front portion extending inward and downward from the left and right front edges creates a void into which soil and plants may be placed, allowing plants to grow from any structure created with the structural building units. These structural building units are suitable for improving the aesthetic value of the structure and providing any structure built therefrom with shade and other methods of cooling, including evapotranspiration, reducing the contribution of the structure to any heat island effect. The plants also lead to improved air quality through conversion of carbon dioxide to oxygen and carbohydrates.



Title: Planter-Brick, Form for Planter-Brick, and Method of Making Planter-Brick

CROSS REFERENCE TO RELATED APPLICATIONS

This application claims priority to U.S. Provisional Patent Application Serial No. 5 62/389,186 entitled "Planter-brick wall systems" and filed February 19, 2016, the contents of which are hereby incorporated by reference in its entirety.

TECHNICAL FIELD

The disclosure generally relates to structural building units, and more particularly, to 10 structural building units out of which plants are able to grow.

BACKGROUND

Concrete and masonry bricks are typically used in building structures. Some of these structures may be walls, used to separate one tract of land from another. Some of these 15 structures may be columns, or raised gardens. Many different types of structures can be built using this type of stackable building unit. However, structures made of this type of building unit may be eyesores, and they may heat up during exposure to the sun throughout the day.

Still, these bricks are commonly used when building structures, and the aesthetic qualities and heating issues ignored.

20 In urban areas, these structures are increasingly common, and the heating of the bricks from the sun can add to the urban heat island effect, driving the temperature even higher in the urban areas than the surrounding suburban and rural neighborhoods. These urban heat island areas can increase summertime peak energy demand, air conditioning costs, air pollution and greenhouse gas emissions, heat-related illness and mortality, and water quality. 25 Accordingly, improved systems and methods for facilitating decreased temperatures of brick structures are desirable, as are structures with increased aesthetic value.

SUMMARY

In an example of an embodiment, a structural building unit is a unitary structure 30 comprising a left side portion with a left front edge and a left back edge, a right side portion with a right front edge and a right back edge, a back portion, and a front portion. The front and back portions extend from and perpendicular to the left side portion and the right side portion. The front portion extends inward and downward from the left front edge and the right front edge.

In another example of an embodiment, a form for a structural building unit comprises a front retaining wall assembly having a front extending interior plate, an internal form assembly having an internal extending interior plate, a central retaining wall assembly, a back retaining wall assembly, and a plurality of connectors. The front extending interior plate and the internal extending interior plate form a channel that extends inward and downward from the front retaining wall assembly. The internal form assembly creates an internal void in the structural building unit. The plurality of connectors removably couple each of the assemblies to one another to make a complete form.

In another example of an embodiment, a method of forming a structure out of structural building units comprises assembling a form, filling the form with a structural material, allowing the structural material to harden within the form for a period of time to form the structural building unit, and removing the structural building unit from the form. The form has a front retaining wall assembly having a front extending interior plate, an internal form assembly having an internal extending interior plate, a central retaining wall assembly, a back retaining wall assembly, and a plurality of connectors. The front extending interior plate and the internal extending interior plate form a channel that extends inward and downward from the front retaining wall assembly. The internal form assembly creates an internal void in the resulting structural building unit. The plurality of connectors removably couple each of the assemblies to one another to make a complete form.

The contents of this summary section are intended as a simplified introduction to the disclosure, and are not intended to be used to limit the scope of any claim.

BRIEF DESCRIPTION OF THE DRAWINGS

A more complete understanding of principles of the present disclosure may be derived by referring to the detailed description and claims when considered in connection with the Figures, wherein like reference numbers refer to similar elements throughout the Figures, and where:

FIG. 1 illustrates an example of a structural building unit, in accordance with various embodiments;

FIG. 2 illustrates an example of a form for making a structural building unit with a cutaway portion to view the interior, in accordance with various embodiments;

FIG. 3 illustrates an example of a front retaining wall having a front extending interior plate and a plurality of connectors, in accordance with various embodiments;

FIG. 4 illustrates an example of an internal form assembly having an internal

extending interior plate, in accordance with various embodiments;

FIG. 5A illustrates an example of a central retaining wall assembly, in accordance with various embodiments;

FIG. 5B illustrates an example of a central retaining wall assembly having a guide
5 and a plurality of connectors, in accordance with various embodiments;

FIG. 6 illustrates an example of a back retaining wall assembly, in accordance with various embodiments; and

FIG. 7 illustrates an example of a structure constructed using multiple structural building units, in accordance with various embodiments.

10 **FIG. 8** illustrates an example of a structure constructed using multiple structural building units with rows offset from one another, in accordance with various embodiments.

It should be appreciated by one of ordinary skill in the art that, while principles of the present disclosure are described with reference to the figures described above, such principles may also include a variety of embodiments consistent with the description herein. It should
15 also be understood that, where consistent with the description, there may be additional components not shown in the system diagrams, and that such components may be arranged or ordered in different ways.

DETAILED DESCRIPTION

20 The detailed description shows embodiments by way of illustration, including the best mode. While these embodiments are described in sufficient detail to enable those skilled in the art to practice the principles of the present disclosure, it should be understood that other embodiments may be realized and that logical and mechanical changes may be made without departing from the spirit and scope of principles of the present disclosure. Thus, the detailed
25 description herein is presented for purposes of illustration only and not of limitation. For example, the steps recited in any of the method descriptions may be executed in any order and are not limited to the order presented.

Moreover, for the sake of brevity, certain sub-components of individual components and other aspects of the system may not be described in detail herein. It should be noted that
30 many alternative or additional functional relationships or physical couplings may be present in a practical system. Such functional blocks may be realized by any number of components configured to perform specified functions.

The disclosure includes a structural building unit that has interior openings allowing the bricks to be filled with soil and to grow plants. By building structures with these units,

the plants contained within the walls are able to convert carbon dioxide into carbohydrates and water through photosynthesis, reducing the levels of carbon dioxide in the atmosphere and providing a cooling effect. Furthermore, the plants can shade the brick walls and the watering of the structural building units and wet soil can lessen the effects of the summer heating of many cinder block walls, leading to a lessened heat island effect found in urban areas. Using these structural building units can increase the area for planting of plants in urban areas where space is at a minimum. Additionally, the addition of growing plants adds aesthetic beauty to the structures.

In various embodiments, an example of a structural building unit comprises multiple portions, including a left side portion, a right side portion, a back portion, and a front portion. The left side portion also has a left front edge and a left back edge, and the right side portion also has a right front edge and a right back edge. The front portion extends inward and downward from the left and right front edges. The structural building unit may therefore be configured to have a containment vessel that may be filled with soil and plants. The containment vessel may be configured to allow access too, and room for growth of plants in a structural building unit below this structural building unit.

Further, an example of a structural building unit is configured to have an opening in the bottom of the containment vessel. In various embodiments, the front portion extends inward and downward to leave a small opening in the bottom of the containment vessel. Such an opening allows for adequate water drainage, ensuring that plants do not become overwatered and further allows plants room to root within the structure.

With reference now to **FIG. 1**, in various embodiments, structural building unit **100** comprises left side portion **110** having a left front edge **120** and a left back edge **130**, a right side portion **140** having a right front edge **150** and a right back edge **160**, a back portion **170**, and a front portion **180**. The back portion **170** extends perpendicular to the left side portion **110** and perpendicular to the right side portion **140** and extends from the left side portion **110** to the right side portion **140**. The front portion **180** also extends perpendicular to the left side portion **110** and the right side portion **140**, and the front portion also extends from the left side portion **110** to the right side portion **140**. The front portion **180** extends inward and downward from the left front edge **120** and the right front edge **150**.

In various embodiments, the back portion **170** may extend inward and downward from the left back edge **130** and the right back edge **160**. In various embodiments, the back portion **170** may extend perpendicular to or flush with the left back edge **130** and the right back edge **160**. In various embodiments, the front portion **180** may extend inward and

downward from the left front edge **120** and the right front edge **150**, leaving an opening on the bottom of the structural building unit **100**.

In various embodiments, the opening on the bottom of the structural building unit **100** may be a long, rectangular opening. In various embodiments, the opening may be an oval. It is contemplated that the opening may be any shape desired. In various embodiments, the opening may comprise a space between the front portion **180** and the back portion **170** that may be located along a plane at the bottom side of the structural building unit **100** or at some location between the top side and the bottom side of the structural building unit **100**.

In various embodiments, the extension of the front portion **180** may not leave an opening at the bottom of the structural building unit **100**. In various embodiments, the front portion **180** may contact the back portion **170** at a location on a plane at the bottom side of the structural building unit **100**. In various embodiments, the front portion **180** may contact the back portion **170** at some location between the top side and the bottom side of the structural building unit **100**.

In various embodiments, there may be holes instead of an opening at the bottom of the structural building unit **100**. In various embodiments, the holes may be along the bottom plane of the structural building unit **100**. In various embodiments, the holes may be along the front portion **180** near the bottom plane of the structural building unit **100**. In various embodiments, the holes may be along the back portion **170** near the bottom of the structural building unit. In various embodiments, the holes may be located in multiple locations, including the front portion **180**, the back portion **170** and along the bottom plane of the structural building unit **100**. In various embodiments, there may be a single hole. In various embodiments there may be two or more holes. In various embodiments, there may be any number of holes, provided that they do not compromise the structural integrity of the structural building unit **100**. In various embodiments, the holes may be small, less than 1 mm. In various embodiments, the holes may be large, with a single hole making up the length and width of the structural building unit **100**. In various embodiments the holes may be medium-sized, from about 1 mm in diameter to the length and width of the structural building unit **100**. In various embodiments, the holes may be formed during the method of making the structural building unit **100**. In various embodiments, the holes may be formed in the porous material of which the structural building unit **100** is made. In various embodiments, the holes may be created after the structural building unit **100** is formed. In various embodiments there may be no openings or holes at all.

The structural building unit **100** may have a length, width, and depth. In various

embodiments, the length, width, and depth may be equivalent to those of standard cinder blocks. In various embodiments, the length, width, and depth may be customized to any desired length, width, and depth.

The structural building unit **100** is a unitary structure. In various embodiments, the structural building unit **100** may be made using a form. In various embodiments, the structural building unit **100** may be made by any method known to those in the art. In various embodiments, the structural building unit **100** may be made of any material capable of being cast in a form and cured within said form. In various specific embodiments, the structural building unit **100** may be made of concrete. The structural building unit **100** is made of a structural material. In various embodiments, the structural material may be a mixture of an aggregate and a cement. In various embodiments, the structural material may be a mixture of an aggregate, a cement, and sand. In various embodiments the structural material may be a mixture of an aggregate, cement, sand, and water. In various embodiments, the mixture may comprise equal amounts of all mixture components. In various embodiments, the mixture may comprise more of one component than the other components. In various embodiments, the mixture may comprise more cement and water than sand and aggregate. In various embodiments, the mixture may comprise a 1:1:1:1 ratio of cement, sand, aggregate, and water, respectively. In various embodiments the mixture may comprise a 2:1:1:2 ratio of cement, sand, aggregate, and water, respectively. In various embodiments, the mixture may comprise a 4:3:3:4 ratio of cement, sand, aggregate, and water, respectively. It will be appreciated by those in the art that, in embodiments which use an aggregate-cement mixture to form the structural building unit **100**, the structural material may comprise any ratio of components known in the art to be used to make structural building units.

In various specific embodiments, the structural building unit **100** may be made of a cement-vermiculite mixture. In various specific embodiments, it may be made of adobe. In various specific embodiments it may be made of fly ash concrete. In various specific embodiments it may be made of bottom ash concrete. In various specific embodiments it may be made of autoclaved aerated concrete. In various specific embodiments, it may be made of a cement-perlite mixture. In various specific embodiments, it may be made of a cement-pumice mixture. In various specific embodiments, it may be made of a cement-polystyrene mixture. In various specific embodiments, it may be made of plaster. In various specific embodiments, it may be made of plastic. In various specific embodiments, it may be made of clay. In various specific embodiments, it may be made of glass. It will be

appreciated by those in the art that the structural building unit **100** may be made out of any material known in the art to be used to make structural building units.

In an example embodiment, a form is disclosed herein for casting structural building units, said form having a front retaining wall assembly, an internal form assembly, a central retaining wall assembly, a back retaining wall assembly, and a plurality of connectors that removably couple the pieces together. In various embodiments, the form may further comprise a customizable piece allowing for personalization of the structural building unit. By creating the form with multiple pieces, it is easier to remove the structural building unit from the form after it has cured without causing damage to the structural building unit. It also allows for a form to be reused.

With reference now to **FIG. 2**, in accordance with various embodiments, a form **200** for making structural building units is shown comprising a front retaining wall assembly **210** having a front extending interior plate **220**, an internal form assembly **230** having an internal extending interior plate **240**, a central retaining wall assembly **250**, a back retaining wall assembly **260**, and a plurality of connectors **270**. In various embodiments, the front retaining wall assembly **210** may further comprise a handle **280**.

Turning now to **FIG. 3**, in various embodiments, a reverse view of the front retaining wall assembly **210** is depicted. In various embodiments, a front retaining wall assembly **210** may be configured with a front extending interior plate **220** extending inward and downward from a front top edge of the front retaining wall assembly **215**. In various embodiments the front retaining wall assembly **210** may further comprise a plurality of connectors **270**.

FIG. 4 depicts, in various embodiments, an internal form assembly **230** having an internal extending interior plate **240**. With momentary reference back to **FIG. 2**, the internal extending interior plate **240** may extend in such a way so as to create a channel **290** between the front extending interior plate **220** and the internal extending interior plate **240**, wherein the channel **290** extends inward and downward from the front retaining wall assembly **210**. In various embodiments, the channel **290** forms the front portion **180** of the structural building unit **100**. In various embodiments, the internal extending interior plate **240** and the front extending interior plate **220** are parallel to one another. In various embodiments, the channel **290** may be straight or planar. In various embodiments, the channel **290** may be curved. It is contemplated that the channel **290** may be any shape desired, so long as the internal extending interior plate **240** and the front extending interior plate **220** do not contact one another. In various embodiments, the internal form assembly **230** may further comprise a handle to aid in removing the internal form.

FIG. 5A depicts an example of a central retaining wall assembly **250**, in various embodiments. The central retaining wall assembly **250** creates the bottom and sides of the form.

Turning to **FIG. 5B** that depicts an example of a central retaining wall assembly **250**
5 in various embodiments, having a guide **255** and a plurality of connectors **270**. In various
embodiments, there may be a single guide. In various embodiments, there may be multiple
guides. In various embodiments, the guide **255** may fit inside a guide hole in the internal
form assembly **230** (not pictured) to provide additional stability to the form.

With momentary reference to **FIGS. 1 and 2**, the central retaining wall assembly **250**
10 is configured to form the left side portion **110** and the right side portion **140** of the structural
building unit **100**. The central retaining wall assembly **250** and the internal form assembly
230 do not contact one another, leaving space for the form to create the left and right side
portions **110, 140** when the form is filled with structural material. In various embodiments,
the space between the central retaining wall assembly **250** and the internal form assembly **230**
15 may be small to create thin left and right side portions **110, 140** in the structural building unit.
In various embodiments, the space between the central retaining wall assembly **250** and the
internal form assembly **230** may be large, creating thick left and right side portions **110, 140**
in the structural building unit. In various embodiments, the central retaining wall assembly
250 and the internal form assembly **230** may create left and right side portions **110, 140** that
20 have the same thickness. In various embodiments, the central retaining wall assembly **250**
and the internal form assembly **230** may create a left side portion **110** that is thicker than the
right side portion **140**. In various embodiments, the central retaining wall assembly **250** and
the internal form assembly **230** may create a right side portion **140** that is thicker than the left
side portion **110**.

25 With reference now to **FIG. 6**, in various embodiments, a back retaining wall
assembly **260** may also be included. The back retaining wall assembly **260** creates the back
side of the form. With momentary reference to **FIGS. 1 and 2**, the back retaining wall
assembly **260** and the internal form assembly **230** do not contact one another, leaving space
for the form to create the back portion **170** when the form is filled with structural material. In
30 various embodiments, the space between the back retaining wall assembly **260** and the
internal form assembly **230** may be small to create a thin back portion **170**. In various
embodiments, the space between the back retaining wall assembly **260** and the internal form
assembly **230** may be large to create a thick back portion **170**. In various embodiments, the
space between the back retaining wall assembly **260** and the internal form assembly **230** may

create a back portion **170** that is similar in thickness to the right and left side portions **110**, **140**. In various embodiments, the space between the back retaining wall assembly **260** and the internal form assembly **230** may create a back portion **170** that is thinner than the right and left side portions **110**, **140**. In various embodiments, the space between the back retaining wall assembly **260** and the internal form assembly **230** may create a back portion **170** that is thicker than the right and left side portions **110**, **140**.

Although one specific form is disclosed herein, any other combination that creates the structural building unit described herein is contemplated. Any form that is filled with structural material that cures into a single, unitary component conforming with the description of the structural building unit described herein is contemplated.

In accordance with various embodiments, a plurality of connectors **270** may be used throughout the form to removably couple individual assemblies to one another. This allows the form to be removed from the final structural building unit after it has cured without risking damage to the structural building unit or the form. In various embodiments, the connectors **270** may comprise clips. In various embodiments the connectors **270** may comprise pin locks. In various embodiments the connectors **270** may comprise the coupling of a pin and a pin receiver. The connectors **270** may be any mechanism known in the art to be capable of removably coupling the assemblies together.

The form **200** may be utilized for creating structural building units out of a structural material. The form **200** may be made from a material that is non-porous, non-reactive with the structural material, and rigid. In various embodiments, the form **200** may be made from metal. In various embodiments the form **200** may be made from fiberglass. In various embodiments the form **200** may be made from plastic. In various embodiments the form **200** may be made from plaster. In various embodiments the form **200** may be made from polyurethane rubber. In various embodiments the form **200** may be made from rigid foam. In various embodiments the form **200** may be made from any material known in the art to be suitable for creating a form for structural building units.

In various embodiments, a removal agent may be used on the interior surfaces of the form **200** to aid in removing the cured structural building unit **100** from the form **200**. In various embodiments, the removal agent may be vegetable oil. In various embodiments, the removal agent may be a commercial release agent. In various embodiments, the removal agent may be heavy paper. In various embodiments, the removal agent may be rosin paper. In various embodiments, the removal agent may be a heavy mill plastic. In various embodiments, the removal agent may be a motor oil. In various embodiments, the removal

agent may be a motor oil and kerosene mixture. In various embodiments, no removal agent may be used. It will be appreciated that any removal agent known in the art may be used to aid in the removal of the structural building unit **100** from the form **200**.

5 A method of forming a structure out of which plants are able to grow is also disclosed herein. The form **200** may be assembled and filled with a structural material. The structural material may be allowed to harden within the form for a period of time to form a structural building unit, and then the unit may be removed from the form. In various embodiments, the structural building unit may be removed from the form by using the connectors **270** that
10 removably couple the individual assemblies of the form to one another. In various embodiments, the structural building unit may be filled with soil. In various embodiments, the structural building unit may be filled with soil and seeds and/or live plants.

In various embodiments, the structural building units may be stacked to form a structure. In various embodiments, the structure may be composed solely of structural building units. In various embodiments, the structure may be composed of a mixture of
15 structural building units and typical building blocks known in the art. In various embodiments, two structural building units may be stacked on top of one another. In various embodiments, two structural units may be placed back to back. In various embodiments, a row of structural building units may be incorporated into a structure made of typical building blocks. In various embodiments, structural building units may be incorporated at random
20 into a structure made of typical building blocks. In various embodiments, structural building units may be incorporated into a structure made of typical building blocks at regular intervals. In various embodiments, structural building units may be incorporated into a structure made out of typical building blocks so as to form a desired design. In various embodiments, structural building units may be incorporated into multiple sides of a structure made of
25 typical building blocks. In various embodiments, a structure may be made entirely of structural building units, at least two units thick. In various embodiments, a row of structural building units may be added on top of a pre-existing structure. In various embodiments, the structural building unit may be configured to have plants growing out of both the front portion and the back portion.

30 In various embodiments, the structure may be a wall **700, 800**, as depicted in **FIGS. 7 & 8**. In various embodiments, the structure may be a column. In various embodiments the planter-bricks may be laid in the same standard layered pattern of typical brick walls. In various embodiments the structure may be a single unit planter. In various embodiments, the structure may be used to enclose a space. In various embodiments, structural building units

may be used in water fountains. In various embodiments the structure may be used to create a raised garden. In various embodiments, the structure may be a glass-topped table. It is contemplated that any structure built using individual units may be built using the structural building unit disclosed herein. It is further contemplated that any structure may be
5 constructed using one or more of the various embodiments described herein.

In various embodiments, a structural building unit may require watering. In various embodiments, a structural building unit may be watered at the top in the containment vessel. In various embodiments, a structural building unit may be watered by gravity, having water fall into the structural building unit from a structural building unit placed higher up. In
10 various embodiments, a structural building unit may be watered individually. It is contemplated that a structural building unit may be watered by any method known in the art, including by rain, by hose, by irrigation system, and by watering can. Nothing indicated herein should be interpreted to limit the method by which a structural unit may be watered.

While the steps outlined herein represent embodiments of principles of the present
15 disclosure, practitioners will appreciate that there are a variety of physical structures and interrelated components that may be applied to create similar results. The steps are presented for the sake of explanation only and are not intended to limit the scope of the present disclosure in any way. Benefits, other advantages, and solutions to problems have been described herein with regard to specific embodiments. However, the benefits, advantages,
20 solutions to problems, and any element(s) that may cause any benefit, advantage, or solution to occur or become more pronounced are not to be construed as critical, required, or essential features or elements of any or all of the claims.

Examples of systems and methods are disclosed. In the detailed description herein, references to "various embodiments", "one embodiment", "an embodiment", "an example of
25 an embodiment", etc., indicate that the embodiment described may include a particular feature, structure, or characteristic, but every embodiment may not necessarily include the particular feature, structure, or characteristic. Moreover, such phrases are not necessarily referring to the same embodiment. Further, when a particular feature, structure, or characteristic is described in connection with an embodiment, it is submitted that it is within
30 the knowledge of one skilled in the art to effect such feature, structure, or characteristic in connection with other embodiments whether or not explicitly described. After reading the description, it will be apparent to one skilled in the relevant art(s) how to implement principles of the disclosure in alternative embodiments.

It should be understood that the detailed description and specific examples, indicating

embodiments, are given for purposes of illustration only and not as limitations. Many changes and modifications may be made without departing from the spirit thereof, and principles of the present disclosure include all such modifications. Corresponding structures, materials, acts, and equivalents of all elements are intended to include any structure, material, or acts for performing the functions in combination with other elements. Reference to an element in the singular is not intended to mean "one and only one" unless explicitly so stated, but rather "one or more." Moreover, when a phrase similar to "at least one of A, B, or C" or "at least one of A, B, and C" is used in the claims or the specification, the phrase is intended to mean any of the following: (1) at least one of A; (2) at least one of B; (3) at least one of C; (4) at least one of A and at least one of B; (5) at least one of B and at least one of C; (6) at least one of A and at least one of C; or (7) at least one of A, at least one of B, and at least one of C.

CLAIMS

What is claimed is:

1. A structural building unit out of which plants are able to grow, comprising:
a left side portion having a left front edge and a left back edge;
5 a right side portion having a right front edge and a right back edge;
a back portion; and
a front portion;

wherein the back portion extends perpendicular to the left side portion and the right
10 side portion;
wherein the back portion extends from the left side portion to the right side portion;
wherein the front portion extends perpendicular to the left side portion and the right
side portion;
wherein the front portion extends from the left side portion to the right side portion;
15 and
wherein the front portion extends inward and downward from the left front edge and
the right front edge.
2. The structural building unit of claim 1, wherein the back portion extends inward and
20 downward from the left back edge and the right back edge.
3. The structural building unit of claim 1, wherein the back portion extends
perpendicular to the left back edge and the right back edge.
- 25 4. The structural building unit of claim 1, wherein the structural building unit is formed
from a form.
5. The structural building unit of claim 1, wherein the front portion extends inward and
downward from the left front edge and the right front edge leaving an opening between the
30 front portion and the back portion.
6. The structural building unit of claim 1, the front portion extends inward and
downward from the left front edge and the right front edge contacting the back portion and
wherein the structural building unit further comprises holes.

7. The structural building unit of claim 1, wherein multiple structural building units are capable of being stacked on top of one another.

5 8. The structural building unit of claim 1, wherein the structural building unit has a length, a width, and a depth equivalent to those of standard cinder blocks.

9. The structural building unit of claim 1, wherein the structural building unit is cast of a structural material in a form and cured within said form.

10

10. The structural building unit of claim 9, wherein the structural material is selected from the group consisting of concrete, cement-vermiculite mixture, cement-perlite mixture, cement-pumice mixture, cement-polystyrene mixture, adobe, fly ash concrete, bottom ash concrete, autoclaved aerated concrete, plaster, clay, plastic, and glass.

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11. A form for a structural building unit out of which plants are able to grow, comprising:
a front retaining wall assembly having a front extending interior plate;
an internal form assembly having an internal extending interior plate;
a central retaining wall assembly;
20 a back retaining wall assembly; and
a plurality of connectors;

wherein the front extending interior plate and the internal extending interior plate form a channel;

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wherein the channel extends inward and downward from the front retaining wall assembly;

wherein the internal form assembly creates an internal void in the structural building unit; and

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wherein the plurality of connectors removably couple each of the front retaining wall assembly, the internal form assembly, the central retaining wall assembly, and the back retaining wall assembly to one or more of the front retaining wall assembly, the internal form assembly, the central retaining wall assembly, and the back retaining wall assembly.

12. The form of claim 11, the internal form assembly further comprising at least one

guide hole and the central retaining wall assembly further comprising at least one guide, wherein the guide fits into the guide hole.

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13. The form of claim 11, wherein the plurality of connectors comprise pin locks.

14. The form of claim 11, wherein the form can be filled with a structural material.

15. The form of claim 14, wherein the form is made from a material that is non-porous, non-reactive with the structural material, and rigid.

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16. The form of claim 15, wherein the material is selected from the group consisting of metal, fiberglass, plastic, plaster, polyurethane rubber, and rigid foam.

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17. The form of claim 11, wherein the extending interior plate and the internal extending interior plate are parallel to one another.

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18. A method of forming a structure out of which plants are able to grow, comprising:
assembling a form;
filling the form with a structural material;
allowing the structural material to harden within the form for a period of time to form a structural building unit; and
removing the structural building unit from the form;

25

the form comprising:
a front retaining wall assembly having a front extending interior plate;
an internal form assembly having an internal extending interior plate;
a central retaining wall assembly;
a back retaining wall assembly; and
a plurality of connectors;

30

wherein the front extending interior plate and the internal extending interior plate form a channel;

wherein the channel extends inward and downward from the front retaining wall assembly;

wherein the internal form assembly creates an internal void in the structural building unit; and

wherein the plurality of connectors removably couple each of the front retaining wall assembly, the internal form assembly, the central retaining wall assembly, and the back retaining wall assembly to one or more of the front retaining wall assembly, the internal form assembly, the central retaining wall assembly, and the back retaining wall assembly.

19. The method of claim 18, further comprising filling the internal void in the structural building unit with a soil and at least one plant selected from the group of seeds and live plants.

20. The method of claim 18, further comprising stacking multiple structural building units in a desired pattern to form the structure.

15

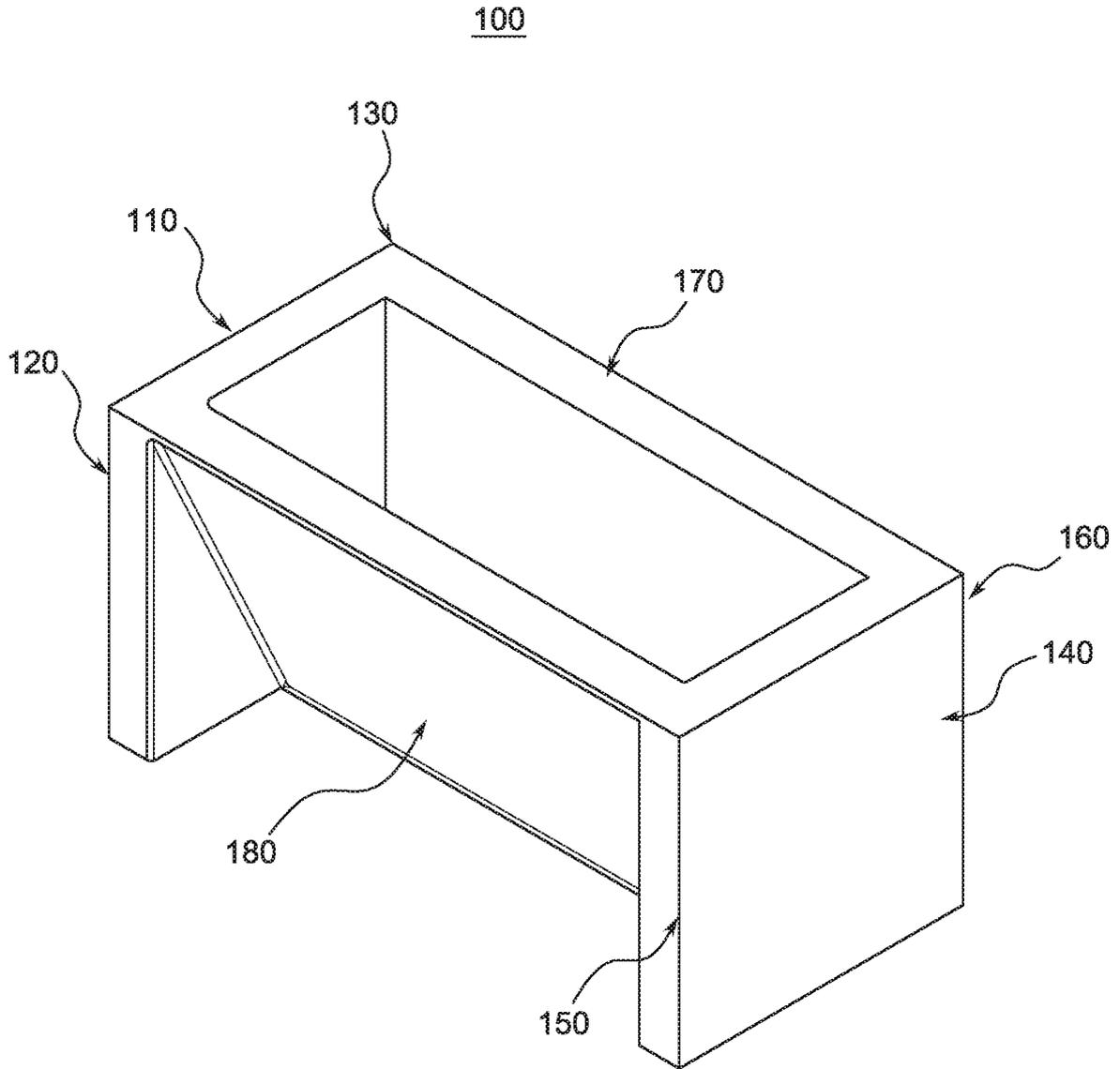


FIG. 1

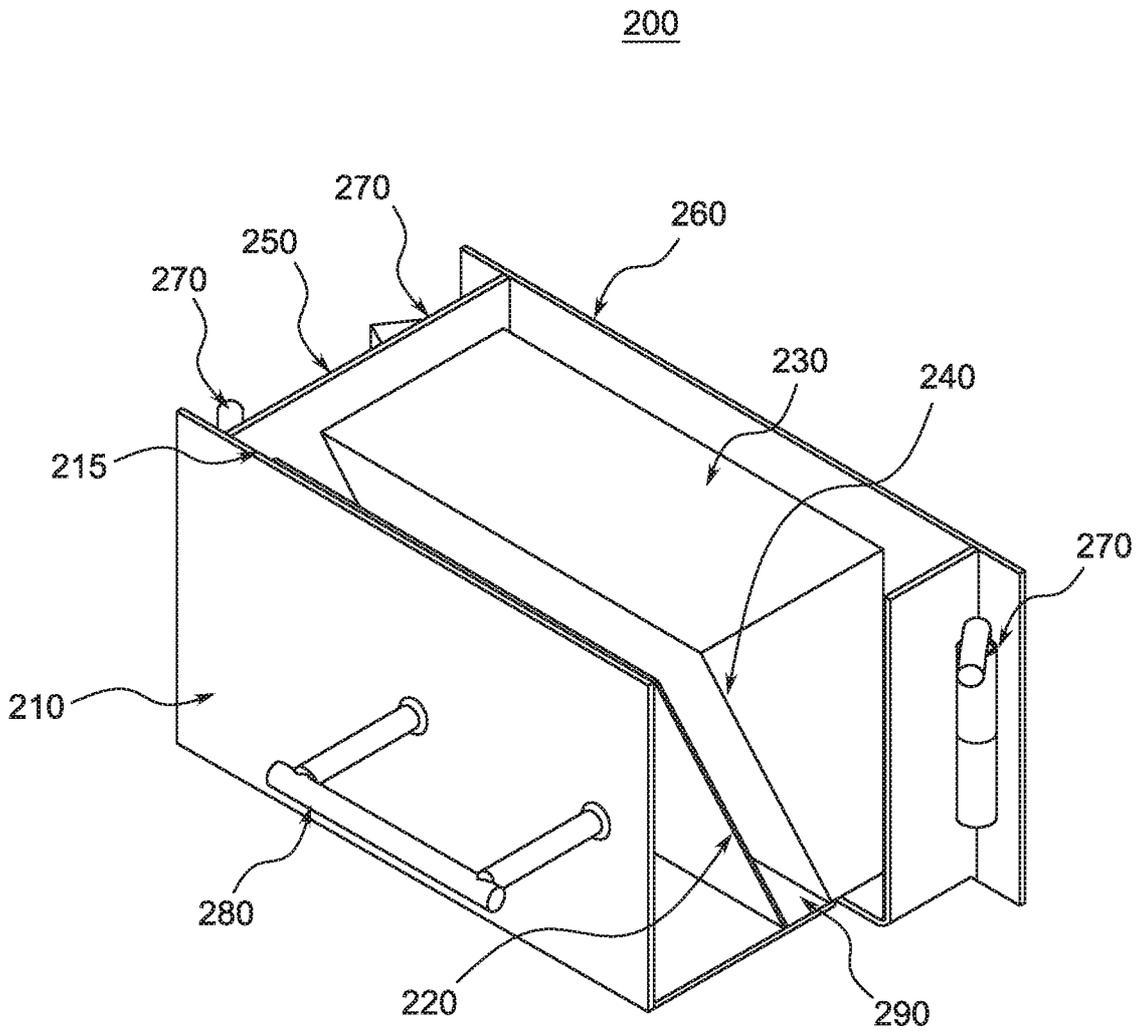


FIG. 2

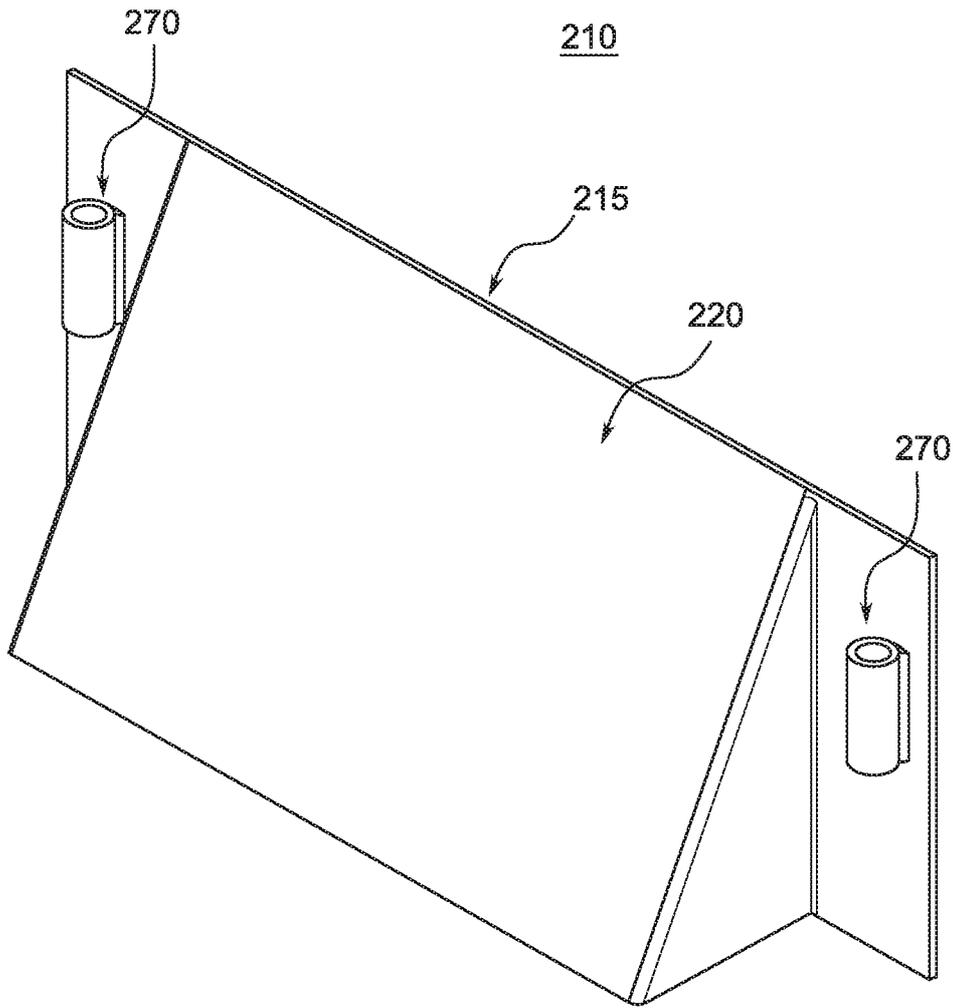


FIG. 3

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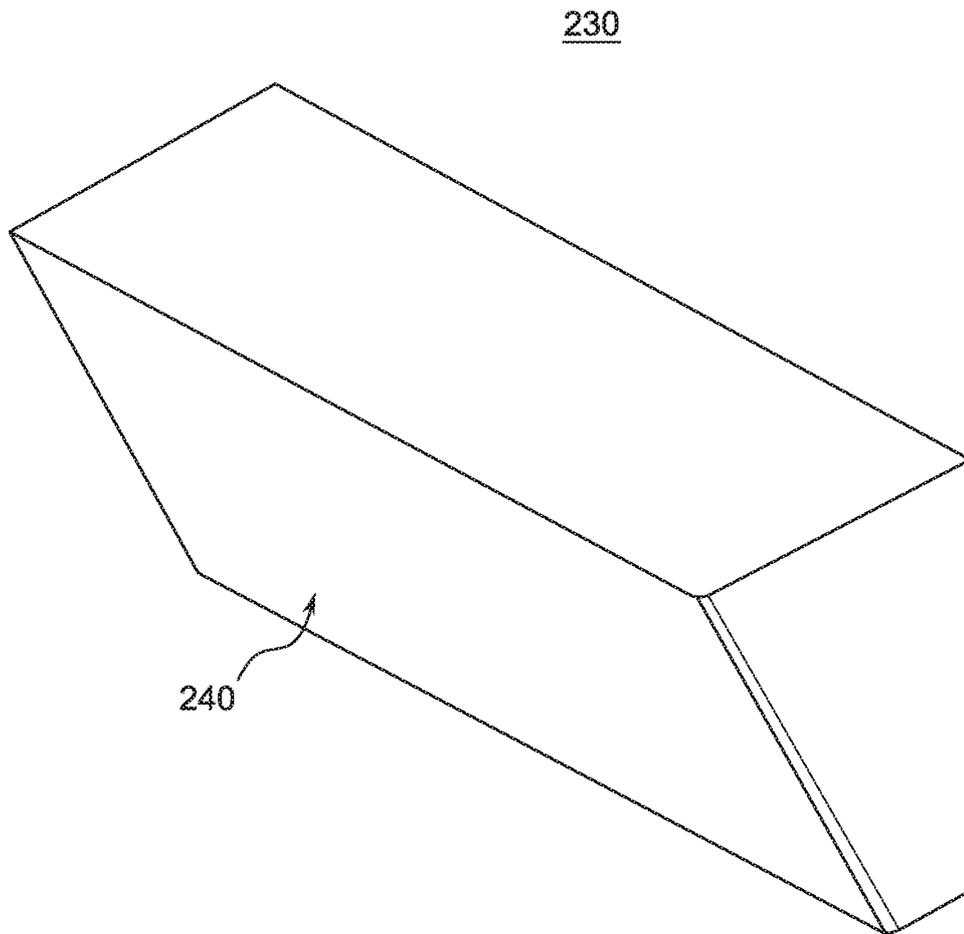


FIG. 4

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250

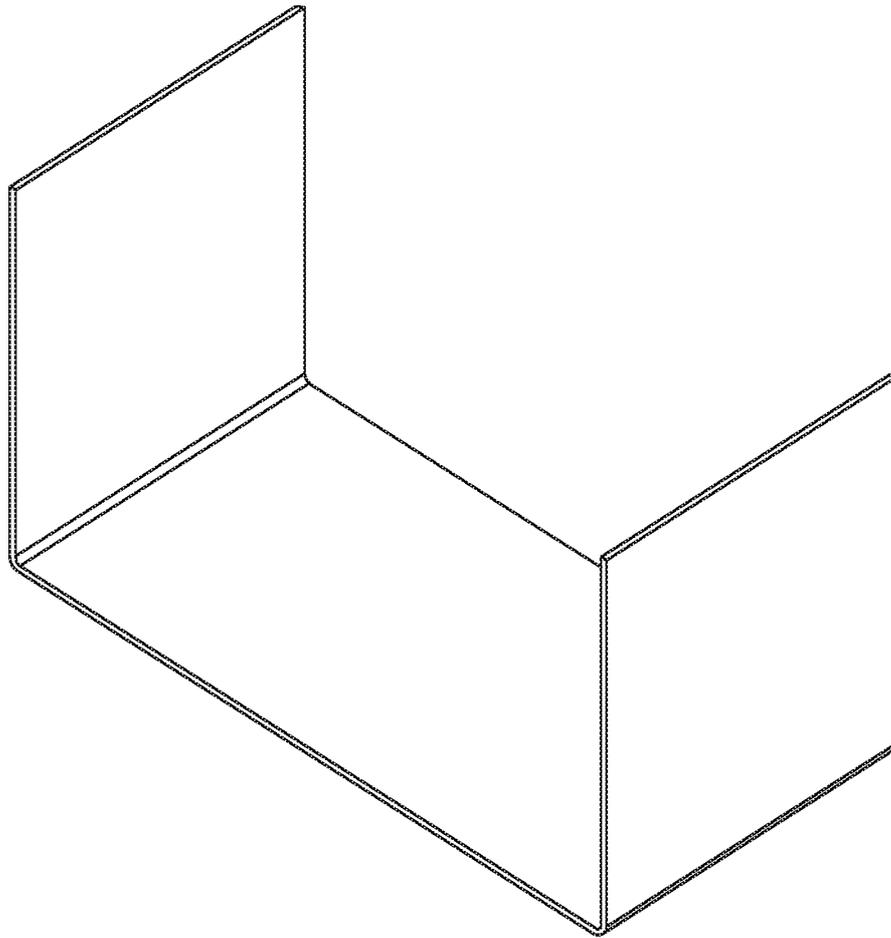


FIG. 5A

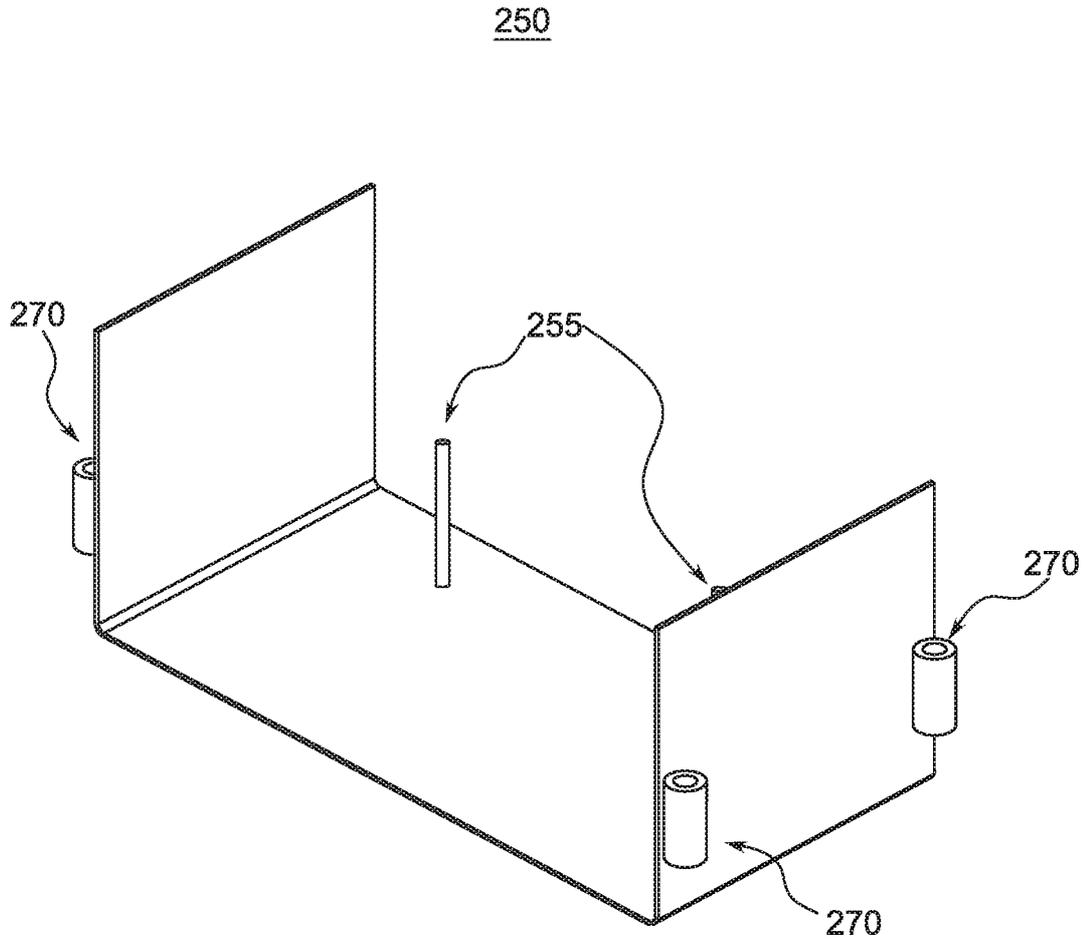


FIG. 5B

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260

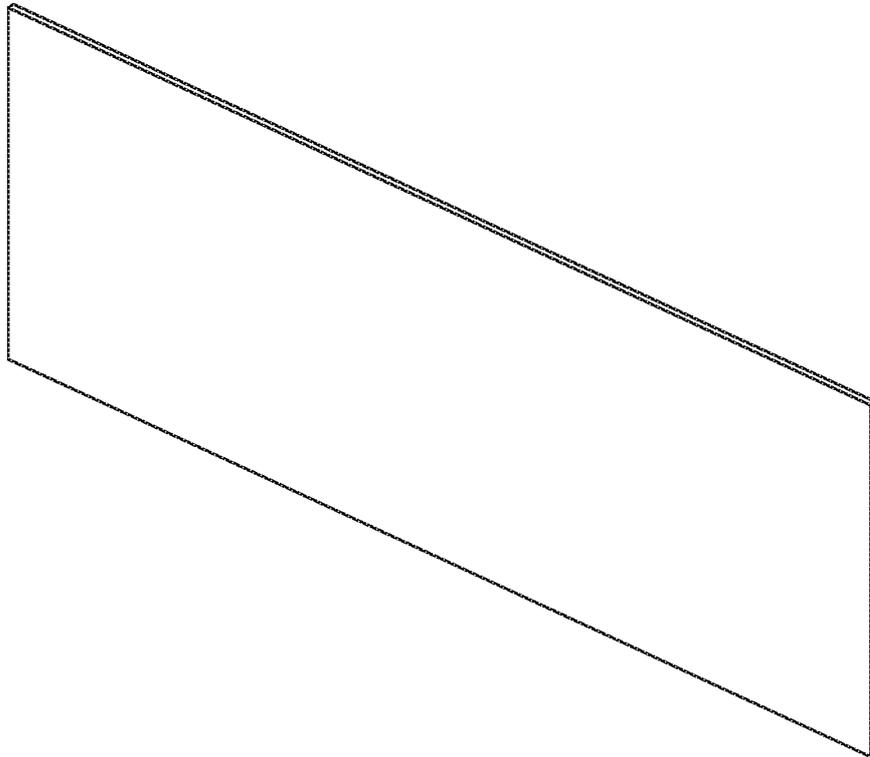


FIG. 6

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700

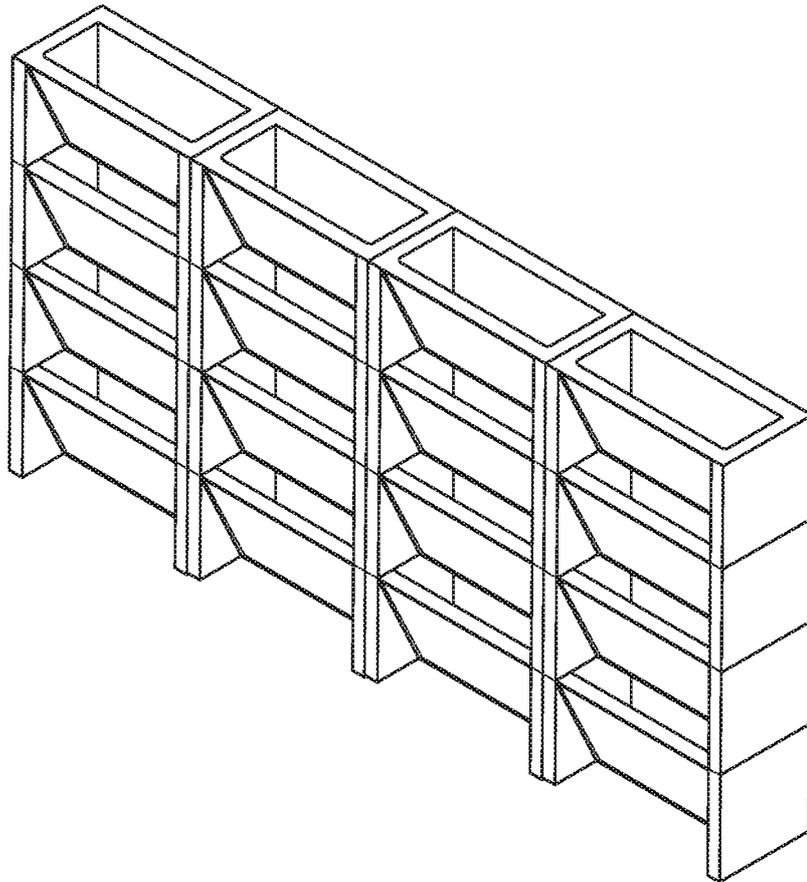


FIG. 7

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800

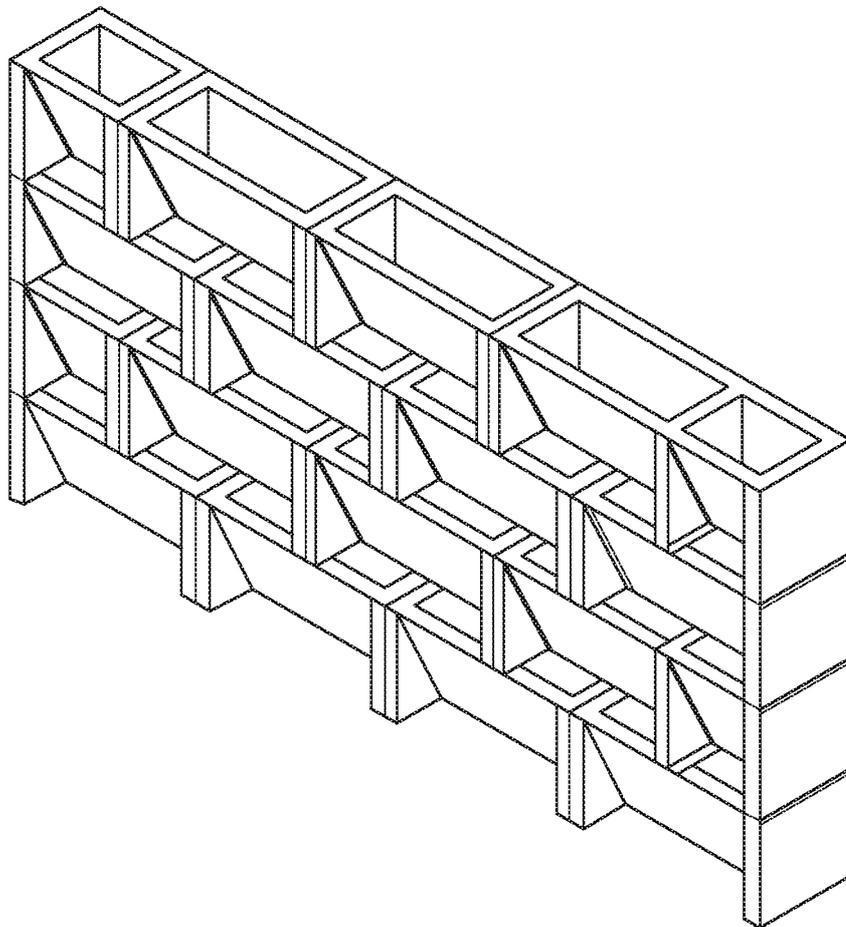


FIG. 8

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US 17/18458

A. CLASSIFICATION OF SUBJECT MATTER
 IPC(8) - A01 G 9/00, A01 G 9/02, E04C 1/00, E04C 1/39, E04H 17/14, B29C 39/02, B29C 39/04 (201 7.01)
 CPC - E04C 1/00, E04C 1/39, E04C 1/395, B28B 7/00, B28B 7/0029, B28B 7/0035, B28B 7/007, B28B 7/0079, B28B 7/36, B28B 7/364

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
 See Search History Document

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
 See Search History Document

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
 See Search History Document

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X ----- Y ----- A	US 3,726,042 A (Haile) 10 April 1973 (10.04.1973) entire document, especially, Title, Abstract, figs. 2, 4, col 3, ln 44-62, col 4, ln 18-25.	1-2 ----- 19 ----- 12, 17
X ----- A	US 2,514,536 A (Burney) 11 July 1950 (11.07.1950) entire document, especially, Title, Abstract, figs. 1, 10, col 1, ln 1-9, col 4, ln 1-1 1.	1, 3-5, 7, 9-10 ----- 12, 17
X ----- A	DE 3420037 A 1 (Dose) 05 december 1985 (05.12.1985) entire document, especially, Title, Abstract, fig. III e 1-10, translation pg 1, ln 25-38, pg 2, ln 1-5.	1, 6, 8 ----- 12, 17
X ----- Y ----- A	US 2010/0242390 A 1 (Lee Lum) 30 September 2010 (30.09.2010) entire document, especially, Title, Abstract, figs. 1-10, para[0036]-[0040].	11, 14, 18, 20 ----- 13, 15-16, 19 ----- 12, 17
Y	US 2008/0095879 A 1 (TU) 24 April 2008 (24.04.2008) entire document, especially, Title, Abstract, figs. 1, para[0019]-[0022].	13
Y	US 2012/0126451 A 1 (Owen) 24 May 2012 (24.05.2012) entire document, especially, Title, Abstract, figs. 1, para[0014].	15-16

Further documents are listed in the continuation of Box C. See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"G" document member of the same patent family

Date of the actual completion of the international search
07 June 2017

Date of mailing of the international search report
29 JUN 2017

Name and mailing address of the ISA/US
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 Facsimile No. 571-273-8300

Authorized officer:
 Lee W. Young
 PCT Helpdesk: 571-272-4300
 PCT OSP: 571-272-7774

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 17/18458

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:
This application contains the following inventions or groups of inventions which are not so linked as to form a single general inventive concept under PCT Rule 13.1. In order for all inventions to be examined, the appropriate additional examination fees must be paid.

Group I: Claims 1-10, drawn to a structural building unit.

Group II: Claims 11-20, drawn to a form for a structural building unit and a method of forming a structure.

The inventions listed as Groups I and II do not relate to a single general inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons:

-See extra Sheet-

1. As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of additional fees.
3. As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- No protest accompanied the payment of additional search fees.

-* Continuation of Box III Observations where unity of invention is lacking* -

SPECIAL TECHNICAL FEATURES

Group I has the special technical features of a structural building unit out of which plants are able to grow, comprising:

- a left side portion having a left front edge and a left back edge;
- a right side portion having a right front edge and a right back edge;
- a back portion; and
- a front portion;

wherein the back portion extends perpendicular to the left side portion and the right side portion;

wherein the back portion extends from the left side portion to the right side portion;

wherein the front portion extends perpendicular to the left side portion and the right side portion;

wherein the front portion extends from the left side portion to the right side portion;

and wherein the front portion extends inward and downward from the left front edge and the right front edge not required by Group II.

Group II has the special technical features of a form for a structural building unit out of which plants are able to grow, comprising:

a front retaining wall assembly having a front extending interior plate;

an internal form assembly having an internal extending interior plate;

a central retaining wall assembly;

a back retaining wall assembly; and

a plurality of connectors;

wherein the front extending interior plate and the internal extending interior plate form a channel;

wherein the channel extends inward and downward from the front retaining wall assembly;

wherein the internal form assembly creates an internal void in the structural building unit; and

wherein the plurality of connectors removably couple each of the front retaining wall assembly, the internal form assembly, the central retaining wall assembly, and the back retaining wall assembly to one or more of the front retaining wall assembly, the internal form assembly, the central retaining wall assembly, and the back retaining wall assembly, not required by Group I.

SHARED TECHNICAL FEATURES

The only technical features shared between Groups I and II is a structural building unit out of which plants are able to grow, which does not provide any contribution over the prior art as it is anticipated by US 3,726,042 A to Haile.

Haile teaches a structural building unit (24; fig.4; Title; Abstract) out of which plants are able to grow (col 3, ln 44-47),

As the common features were known in the art at the time of the invention, they cannot be considered special technical features that would otherwise unify the groups.

Therefore, Groups I-II lack unity under PCT Rule 13 because they do not share a same or corresponding special technical feature.