

A MODULAR AND CUSTOMISABLE PLANTING SYSTEM

FIELD OF INVENTION

The invention relates to a modular and customisable planting system.

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BACKGROUND TO THE INVENTION

The following discussion of the background to the invention is intended to facilitate an understanding of the present invention. However, it should be appreciated that the discussion is not an acknowledgment or admission that any of the material referred to was published, known or part of the common general knowledge in any jurisdiction as at the priority date of the application.

Urban heat island effect (UHIE) refers to the phenomenon when city temperatures run higher than those in suburban and rural areas. UHIE occurs primarily due to the growing numbers of buildings being built as a consequence of urbanization and economic growth, and these growing numbers of buildings have supplanted vegetation and trees previously filling the city area. In addition, human activities generate heat and such generation of heat contributes to the rise in city temperatures.

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In an attempt to reduce the adverse influence of the UHIE, vegetations are grown on rooftops (i.e. green roof) to compensate for the loss of supplanted vegetation and trees. The vegetations serve to filter greenhouse gases such as carbon dioxide and other toxins in the city. It has been studied and demonstrated that such green roofs help to reduce roof ambient temperature and that heat transfer

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from the roof to the rooms directly underneath the roof is lowered. A reduced ambient temperature and a lowered heat transfer from the roof to the rooms directly underneath the roof may result in lesser dependence on air-conditioning, thereby lessening the building's energy consumption.

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In a typical green roof system, plants are conveniently housed in individual plant trays connected together to provide a larger surface area of greenery. Even though plant trays are commonly found in a variety of different sizes and shapes, most of them, if not all, are configured in almost the same way, that being a
10 container (conveniently a box-shaped design) having an orifice near the bottom end of a side wall of the plant tray as a drainage means. The drainage means allows excess fluids such as water, fertilizers, chemicals and other liquids poured into the plant soil or plant substrate to advantageously drain out of the plant tray instead of building up in the plant tray and harming the plant (i.e. root rot, leaching
15 of nutrients and the like).

Up to now, the above provides a low maintenance extensive green roof system that may be deployed quickly to provide instant greening or vegetation for both new and existing buildings. For extensive greening, the design of the green roof
20 system is often limited by the choice of plant species due to its limited substrate thickness. In other words, the types of plants suitable for extensive green roof systems are those that do not require deep substrates for healthy growth. There are not many varieties of such plant species and the limited selection therefore translates to a somewhat monotonous green roof system.

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It is desirable to provide for a planting system that accommodates more varieties of plant species, including those requiring deep substrates for healthy growth.

SUMMARY OF THE INVENTION

- 5 Throughout this document, unless otherwise indicated to the contrary, the terms “comprising”, “consisting of”, and the like, are to be construed as non-exhaustive, or in other words, as meaning “including, but not limited to”.

10 In a first aspect of the present invention, there is provided a modular and customisable planting system comprising a plurality of panels connected to one another to form an enclosure therein, each panel adapted to be connected laterally and/or vertically to at least one other panel. Advantageously, the plurality of panels provides modular and customisable design to afford landscape design.

15 Advantageously, each panel is adapted to be connected to its adjacent panel by connecting means. Preferably, the connecting means is a locking stud.

Advantageously, the upper and lower end of each panel comprises a flange. When in use, these flanges are flushed to the surface which they contact to provide greater stability and contact area.

20 Preferably, each panel is formed using lightweight and durable materials for easy portability and installation, so that it is able to withstand harsh weather conditions.

Preferably, such lightweight and durable materials include high density polypropylene, high density polyethylene, acrylics. Alternatively, wood and composites may also be used to form the panels.

Preferably, the flange is bent substantially perpendicular to a face of the panel.

Preferably, the bottom end and/or top end of each panel is provided with at least one hole.

Preferably, the sides of each panel are provided with at least one hole.

Preferably, the planting system further comprises stiffening means for stiffening
5 the structure of the planting system.

In a second aspect of the present invention, there is provided a panel for use in a modular and customisable planting system, the panel adapted to stack onto a plant tray, each panel further securable to the plant tray via locking studs.

10 BRIEF DESCRIPTION OF THE DRAWINGS

In the figures, which illustrate, by way of example only, embodiments of the present invention,

Figure 1 shows a first embodiment of the present planting system positioned on the ground;

15 **Figure 2** shows the planting system of the first embodiment arranged in a variety of shapes and size.

Figure 3 shows a second embodiment of the present planting system positioned on plant trays.

Figure 4 shows how each panel of the second embodiment may be stacked
20 vertically/laterally with other similar panels to create a 'layering effect'; and

Figure 5 shows an example of the different planting depth arising from the 'layering effect' as depicted in **Figure 4**.

DETAILED DESCRIPTION

The invention relates to a modular and customisable planting system that is capable of accommodating more varieties of plant species, including those requiring deep substrates for healthy growth.

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Figure 1 shows an embodiment of the modular and customisable planting system in accordance with a first aspect of the invention. The planting system **10** comprises a plurality of panels **12** connected to one another to form an enclosure therein. Each panel **12** comprises an upper panel part **12a** and a lower panel part **12b**. In the embodiment illustrated, a 6x5-panel rectangular enclosure is formed. It is to be appreciated that the plurality of panels **12** may be arranged to be formed into other shaped enclosures such as triangle, square or polygon, such as those illustrated in **Figure 2**.

15 The enclosure formed by the plurality of panels **12** may be a closed one (as illustrated in **Figure 1**) or an open one. To form an open enclosure, a wall or any vertical surface such as a fence, may be used in place of one side of the enclosure. For example, a rectangular enclosure may be created by forming a three-sided structure having generally a U-shape, and positioning the three-sided structure against the wall or vertical surface at the open side of the enclosure. In this arrangement, the wall or vertical surface substitutes one side of the rectangular enclosure. This arrangement is particularly useful in areas where spaces are restricted. Besides the ability to customise the shape of the enclosure, there is better utilisation of existing structures and a reduction in the number of panels needed to form the enclosure, thereby saving materials and costs.

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Conveniently, each panel **12** is rectangular in shape and comprises a first face **14** and a second opposing face **16**, a first lateral side **18** and a second opposing lateral side **20**, a top end **22** and a bottom end **24**. The top end **22** and bottom end **24** of the panel **12** are typically flanges bent substantially perpendicular to the first face **14** and second face **16**. For the convenience of orientation and illustration, the first face **14** may be defined as the side facing the interior of the enclosure and the second face **16** may be defined as the side facing away from the interior of the enclosure.

The first lateral side **18** and the second lateral side **20** are each provided with at least one hole **26**. The position of the at least one hole **26** in the first lateral side **18** and the second lateral side **20** are at identical interval and location. The first lateral side **18** of the panel **12** is positioned immediately adjacent the second lateral side **20** of an adjacent panel **12**. The first lateral side **18** of the panel **12** is connected to the second lateral side **20** of the adjacent panel **12** by connecting means such as locking studs via the corresponding holes in the first lateral side **18** and the second lateral side **20**. Advantageously, the locking studs provide a strong connection between adjacent panels **12** and yet at the same time they may be easily unlocked for dismantling purposes. It is to be appreciated that other connecting means such as brackets, hinges, slide bolts, or hook/eye fasteners may also be used.

The bottom end **24** and/or top end **22** of each panel **12** or panel part **12a**, **12b** is preferably provided with at least one hole **28**. When the planting system **10** is to be positioned on the ground, securing means such as screws or pipes may be

inserted into the ground via the hole **28** to hold the planting system **10** firmly in place. Alternatively, when the planting system **10** is to be positioned on a horizontal platform such as a table or stage, securing means such as screws, bolts and nuts may be inserted through the hole **28** to hold the planting system **10** firmly in place. The advantage of doing so is to prevent accidental toppling or slipping of the planting system **10**.

The panel **12** is preferably formed of lightweight and durable materials for easy portability and installation, and able to withstand harsh weather conditions. Such materials include plastics such as high density polypropylene, high density polyethylene, acrylics, etc. Wood and composites may also be used as panels. The panel may also be made transparent for viewing pleasure or opaque for privacy. The planting system **10** may also comprise a combination of transparent panels **12** and opaque panels **12** for decorative purpose, for example.

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Figure 3 shows a typical arrangement of a plurality of plant trays **40** for use in a green roof system. In the simplest and most common form, the plant trays **40** are formed of a rectangular structure having a base having four walls extending upwards therefrom to define a tray interior. The tray interiors are subsequently filled with plant substrates. The commonly available trays come in standard, non-customisable sizes and dimensions. Some species of plants require a deeper substrate depth than others. Hence, the depth of the commonly available trays may not be adequate for optimal plant growth for such plants.

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Utilisation of the present planting system **10** will provide a customisable plant tray depth. The panels **12** are stacked onto the plant trays **40** and are secured to the plant trays **40** by locking studs, for example. The plant trays preferably have corresponding holes provided on the top end **22** to accommodate the locking studs inserted through the holes **28** provided on the bottom end **24** of the panels **12**. Conveniently, the dimensions of each panel **12** correspond to those of each plant tray **40**. With the stacking of panels **12** on top of the plant trays **40**, the depth for accommodating plant substrates may be customised and varied. The panels **12** help to ensure that the plant substrates are contained within the planting system **10** and will not collapse. Although it has been illustrated in **Figure 3** that the panels **12** are formed on the perimeter of the 3x3 plant trays arrangement, it is to be appreciated that panels **12** may additionally be formed in the interior of the arrangement to form several sections therein. In this manner, the arrangement may contain different sections having different plant substrate depths, and therefore different species of plants. This creates a more varied viewing pleasure and surrounding. Advantageously, the top ends **22** of the panels **12** may be used to support irrigation pipes providing irrigation to the interior of the arrangement. For example, to include a mechanical irrigation system (not shown), such as a drip-line system, to the planting system **10**, the irrigation system can be run and secured along the top ends **22** of the panels **12**. The irrigation system can be secured to the top ends **22** by securing means such as wires, brackets or screws.

Advantageously, the planting system **10** may further comprise stiffening means for stiffening the structure of the planting system **10** (not shown). The stiffening means can be in the form of a rib or the like. The stiffening means is coupled to at

least one panel **12**, and at least a portion of the stiffening means is positioned within the enclosure formed by the panels **12**. In the arrangement where there is a plurality of plant trays **40**, the stiffening means may be coupled to at least one wall of the plant tray **40**, and at least a portion of the stiffening means is positioned
5 within the plant tray **40**. It is to be appreciated that the stiffening means may also be coupled to at least one of the panels **12** that are stacked on the plant tray **40**.

In one embodiment, the stiffening means is arranged along the two diagonals of the enclosure formed by the panels **12**. It is to be appreciated that the stiffening
10 means may be arranged along only one of the diagonals of the enclosure instead of both diagonals. It is to be further appreciated that the stiffening means may be arranged between any two panels **12** of the enclosure instead of along one or both of the diagonals. The stiffening means may also be arranged between one of the panels **12** and the base of the enclosure. Similarly, it is to be appreciated that in
15 the arrangement where there is a plurality of plant trays **40**, the stiffening means may be arranged along one or two of the diagonals of the plant tray **40**, between any two walls of the plant tray **40**, or between one of the walls and the base of the plant tray **40**. It is to be further appreciated that the stiffening means may be arranged between one of the panels **12** that is stacked on the plant tray **40** and the
20 base of the plant tray **40**.

The afore-described planting system provides a cost effective and low maintenance system for achieving variable and customisable/scalable plant substrate depths. The planting system is easily assembled and dismantled for re-
25 construction, and the panels are reusable. The planting system affords simplicity:

one type of connecting means may be used for both vertical stacking and lateral joining of panels, and one standard panel size as the basic building structure.

Further, the vertical stacking and lateral joining of panels **12** may be easily customized to achieve a layering effect, as illustrated in **Figure 4**. Such layering,

5 as mentioned earlier, allows for different planting depth within the planting system as illustrated in **Figure 5**.

By using low cost panels and connecting them together laterally and/or vertically, it is possible to construct a modular planting system on existing green roofs and
10 achieve instant greening effects, stimulating creativity and promoting community harmony. Communal activities such as urban gardening help to promote and encourage more people to participate in the same activity. For example, the green roof may comprise different sections having different heights and different plant species. A mixture of children, adults and elderly may be simultaneously involved
15 in maintaining the different sections of the green roof. Besides improving the landscape designs of green roofs, community harmony and social responsibility may be instilled within the community.

Although the foregoing invention has been described in some detail by way of
20 illustration and example, and with regard to one or more embodiments, for the purposes of clarity of understanding, it is readily apparent to those of ordinary skill in the art in light of the teachings of this invention that certain changes, variations and modifications may be made thereto without departing from the spirit or scope of the invention as described in the appended claims. For example, one of the
25 panels **12** may be pivotally connected via a hinge at either the first lateral side **18**

or second lateral side 20. That panel 20 may then serve as a swinging door for entry into and exit from the enclosure.

While each panel **12** comprises an upper panel part **12a** and a lower panel part
5 **12b** as depicted in **Figure 1**, it is easily appreciated that each panel 12 may
comprise entirely of an upper panel part 12a or 12b lower panel part 12b (see
Figure 4).

It should be further appreciated that although the invention covers individual
10 embodiments, it also includes combinations of the embodiments discussed. For
example, the features described in one embodiment is not being mutually
exclusive to a feature described in another embodiment, and may be combined to
form yet further embodiments of the invention.

WE CLAIM:

1. A modular and customisable planting system comprising a plurality of panels connected to one another to form an enclosure therein, each panel
5 adapted to be connected laterally and/or vertically to at least one other panel.
2. A modular and customisable planting system according to claim 1, wherein each panel is adapted to be connected to its adjacent panel by connecting means.
- 10 3. A modular and customisable planting system according to claim 2, wherein the connecting means is a locking stud.
4. A modular and customisable planting system according to any preceding claim, wherein the upper and lower end of each panel comprises a flange.
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5. A modular and customisable planting system according to claim 4, wherein the flange is flushed to the surface which it contacts.
6. A modular and customisable planting system according to any preceding
20 claim, wherein each panel is formed using one or more of the following: high density polypropylene, high density polyethylene, acrylics or wood.
7. A modular and customisable planting system according to claim 4, wherein the flange is bent substantially perpendicular to a face of the panel.

8. A modular and customisable planting system according to any preceding claim, wherein the bottom end and/or top end of each panel is provided with at least one hole.

5 9. A modular and customisable planting system according to any preceding claim, wherein the sides of each panel are provided with at least one hole.

10. A modular and customisable planting system according to any preceding claim, wherein the planting system further comprises stiffening means for stiffening
10 the structure of the planting system.

11. A panel for use in a modular and customisable planting system, the panel adapted to stack onto a plant tray, each panel further securable to the plant tray via locking studs.

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