(54) Title: ROOTING STRUCTURE

(57) Abstract: The present invention relates to rooting structures for receiving rooting plugs comprising seedlings, young plants or plants. Specifically, the present invention relates to rooting structures (1) having a strip-shaped geometry that is deformable from a flat state wherein the rooting structure (1) generally extends in a flat plane to a curved state wherein the structure surrounds a volume for receiving a rooting plug (21), the strip-shaped geometry having, in its flat state, a pair of mutually opposite short side edges (11, 12) and a pair of mutually opposite long side edges (13, 14), as well as a bottom surface (6) forming, in its curved state, a convex side, and a top surface (4) forming, in its curved state, a concave side, the top surface has a relief pattern extending between the pair of mutually opposite short side edges (11, 12) extending between the pair of mutually opposite long side edges and a generally straight top edge (17) having a protrusion (18) extending upwardly at a long side edge (14) of the strip-shaped geometry.

FIG. 2

Declarations under Rule 4.17:
- as to applicant’s entitlement to apply for and be granted a patent (Rule 4.17(ii))
- of inventorship (Rule 4.17(iv))

Published:
- with international search report (Art. 21(3))
The present invention relates to rooting structures for receiving rooting plugs comprising seedlings, young plants or plants and the use thereof for cultivating seedlings, young plants or plants such as orchids.

Rooting plugs are used for cultivating plants. Typically, rooting plugs can be made from a substrate including organic and/or non-organic material for cultivation of a plant, comprising a plug body that is substantially cylindrically shaped around a cylinder axis, the plug having a bottom surface, a side surface and a top surface.

Such rooting plugs are, for example, known from EP 2 572 571, wherein a rooting plug is provided with a root chamber for accommodating at least a part of a root structure of a plant, a stem passage extending through the top surface of the plug body to the root chamber, and a receptive slot opening in the outer side surface of the plug body, the slot opening extending in a longitudinal direction from the bottom surface to the top surface and in a lateral direction from the outer surface to the root chamber and the stem passage for enabling a lateral insertion of the root structure into the root chamber.

After plant material has passed a first growing stage the rooting plug can be placed in a pot filled with ground, the ground being pre-drilled to provide a volume for receiving the rooting plug. Then, the plant material can develop for further cultivation stages. However, use of these rooting plug in a commercial setting taught that the diameter of the pre-drilled cavity can be too small resulting in damaged roots emerging from the rooting plug, or pre-drilled cavity is too large resulting in that the rooting plug is loose in the cavity reducing effective root growth into the surrounding substrate.

EP 3 000 314 discloses structures for cultivation of a plant comprising a growth medium, wherein the structure has a longitudinal axis and an external surface. The external surface is defined by an upper surface part, a lower surface part opposite to the upper surface part, an outer surface part and an inner surface part opposite to the outer surface part. The structure is transformable from a first shape into a second shape, wherein, viewed in a plane transverse to the longitudinal axis, the outline of the second shape is determined by the outer surface part and wherein, in the first shape, the structure is unfolded such that the inner surface part is exposed to the surrounding and wherein, in the second shape, the structure is folded up such that the inner surface part is folded up onto itself.

The structures of EP 3 000 314 are in unfolded form not flat making transport thereof inefficient. Further, the structures disclosed are intended for directly encapsulating the roots
of seedlings, young plants or plants thereby effectively forming a rooting plug and not a structure for receiving a rooting plug comprised of a growth substrate and a rooted seedling, young plant or plant. Furthermore, the structures disclosed in EP 3 00 314 do not form, in folded state, a closed bottom section. The absence of a closed bottom section results in that the developing roots are directly exposed to the environment (generally air) and not embedded in, and thus protected by, a growth substrate. This allows pathogens and pests direct contact with the developing roots making the plants vulnerable to diseases. For example, direct exposure of developing orchid roots to air, i.e. not embedded in a growth substrate, results in an increased vulnerability of the orchids to pot worms such as annelid worm of the genus *Enchytraeus*, larvae of the family Kleroplataidae for example Lyprauta spp., Proceroplatus spp. or of the family Culicidae.

EP 2 572 571 discloses a plug for cultivation of a plant. The plug comprises a substantially cylindrical plug body having a top surface, an outer side surface and a bottom surface. The plug body comprises a root chamber for accommodating at least a part of a root structure of the plant. The plug body further comprises a stem passage extending through the top surface of the plug body to the root chamber, and has a receptive slot opening in the outer side surface of the plug body.

The plugs disclosed in are intended for directly encapsulating the roots of a plant thereby effectively forming a plug and not a structure for encapsulating a plug already comprised of a growth substrate and a rooted plant. Furthermore, the plugs disclosed in EP 2 572 571 do not form, in folded form, a protective bottom section made of the substrate. As outlined above, the absence of a closing bottom section results in a vulnerability of the seedling, young plant or plants to pathogens and pests by allowing direct access to the developing roots.

EP 0 172 060 discloses a culture substrate consisting of a cylindrical plug. To improve the development of plant organs, such as seedlings, the cylindrical plug is formed from long fibers disposed radially relative to the axis of the plug and obtained from an artificial pile material cut into a strip, folded on itself in order to form a cylinder, the two end lips of the strip then being fastened to each other, for example by sewing, adhesive bonding or welding.

Again, the plugs disclosed by EP 0 172 060 are intended for directly encapsulating the roots of a plant thereby effectively forming a rooting plug and not a structure for encapsulating a plug already comprised of a growth substrate and a rooted seedling, young plant or plant. Furthermore, the structures disclosed in EP 0 172 060 do not form, in folded form, a closing bottom section. Again, the absence of a closing bottom section results in vulnerability of the seedling, young plant or plant to pathogens and pests by allowing direct access to the developing roots (tips).

Considering the above, it is an object of the present invention, amongst other objects, to obviate at least partially drawbacks associated with prior art plugs.
This object of the present invention, amongst other objects, is met by providing rooting structures as outlined in the appended claims.

Specifically, this object of the present invention, amongst other objects, is met by providing a rooting structure made from a substrate including organic and/or non-organic material for cultivation of a seedling, young plant or plant, the rooting structure having a strip-shaped geometry that is deformable from a flat state wherein the rooting structure generally extends in a flat plane to a curved state wherein the structure surrounds a volume for receiving a rooting plug, the strip-shaped geometry having, in its flat state, a pair of mutually opposite short side edges and a pair of mutually opposite long side edges, as well as a bottom surface forming, in its curved state, a convex side, and a top surface forming, in its curved state, a concave side, the top surface, in a flat state, has a relief pattern extending between the pair of mutually opposite short side edges including a multiple number of grooves extending between the pair of mutually opposite long side edges and the relief pattern further includes a multiple number of ridges alternating with the grooves wherein the multiple number of grooves have, in a cross section through the pair of long side edges, a generally straight top edge having a protrusion extending upwardly at a long side edge of the strip-shaped geometry.

The present multiple number of ridges alternating with the grooves are preferably at least 6, at least 7, at least 8, at least 9, at least 10, at least 11, at least 12, at least 13, at least 14, at least 15 or at least 16 depending on the circumference of the rooting plug, i.e. needed to substantially surround the rooting plug.

According to the present invention, substantially surrounding the rooting plug does not necessarily result in completely, apart from the top surface, encapsulating the rooting plug. When a rooting plug is placed in the present rooting structure (in folded state) or the present rooting structure is wrapped around a rooting plug, the top end of the rooting plug can be at a lower, the same or a higher position than the top surface (in folded state) of the present rooting structure. Formulated differently, the present rooting structure (in folded state) provides a volume, defined by a bottom part and side walls, capable of accommodating a rooting plug but the volume provided may be smaller, the same or larger than the volume of the rooting plug to be accommodated.

According to a preferred embodiment, the present rooting structures have, in a cross section through the pair of long side edges, a generally straight bottom edge having a beveled edge portion at a long side edge of the strip-shaped geometry opposite to the first long side edge.

In folded state, the beveled edge portion provides that supplemented water which can not be immediately absorbed by the substrate can be temporarily “stored” to be absorbed at a later point in time. When prior art structures without such beveled edge are used excess water will
drop off and thus will no longer be available for the seedlings, young plants or plants. This is also designated in the art as “uneven watering”.

According to an especially preferred embodiment, the protrusions and beveled edges are on opposite sides of the rooting structure.

According to the present invention, the grooves are substantially V-shaped. The present grooves are preferably distributed between the pair of mutually opposite short side edges in a substantially uniform manner.

According to the present invention a ridge of the multiple number of ridges can have, in a cross section through the pair of short side edges, a truncated wedge shaped profile.

According to the present invention the protrusion is at a first long side edge of the strip-shaped geometry and the beveled edge portion is at a second long side edge of the strip-shaped geometry.

Preferably, at least one long side edge of the pair of long side edges of the strip-shaped geometry is curved or strip-shaped geometry in the curved state surrounds a separate rooting plug.

The present invention relates to container comprising the present rooting structures and a separate rooting plug that is surrounded by the rooting structure, the rooting plug preferably comprises a seedling, young plant or plant, preferably an orchid.

The present invention also relates to methods for cultivating seedlings, young plants or plants comprising the steps of:

a) providing a rooting plug having a side wall and containing a root of a seedling, young plant or plant, preferably an orchid;

b) providing a present rooting structure; and

c) wrapping the present rooting structure around the side wall of the rooting plug or folding the present rooting structure and placing the rooting plug in the volume thus formed thereby substantially surrounding the bottom part and at least partially the side walls of the rooting plug.

According to the present invention, a structure is provided, made from a substrate including organic and/or non-organic material for cultivation of a plant, the structure having a strip-shaped geometry that is deformable from a flat state wherein the structure generally extends in a flat plane to a curved state wherein the structure at least partially surrounds a volume, the strip-shaped geometry having, in its flat state, a pair of mutually opposite short side edges and a pair of mutually opposite long side edges, as well as a bottom surface forming, in its curved state, a convex side, and a top surface forming, in its curved state, a concave side. By providing a deformable strip-shaped geometry, the rooting plug structure can easily be wrapped around the
rooting plug with the plant material, thereby virtually enlarging the volume of the rooting plug material without damaging any roots emerging from the rooting plug.

The top surface has a relief pattern extending between the pair of mutually opposite short side edges, thereby minimizing internal stress in the structure when the strip-shaped geometry is brought into the curved state. The relief pattern may include a multiple number of grooves extending between the pair of mutually opposite long side edges, thereby simplifying deforming the strip-shaped geometry in its curved state.

 Advantageously, a ridge between two adjacent grooves may have, in a cross section through the pair of long side edges, a generally straight top edge having a protrusion extending upwardly at a long side edge of the strip-shaped geometry. Then, the protrusion may serve as a support for carrying the original rooting plug, and for closing a space below said original rooting plug to counteract an undesired growth of harmful larvae.

 Optionally, the structure has, in a cross section through the pair of long side edges, a generally straight bottom edge having a beveled edge portion at a long side edge of the strip-shaped geometry to realize a downwardly inclined top portion near a side wall of container containing the curved rooting plug structure, thus reducing a chance that roots grow above and beyond said container side wall.

Figures

Figure 1: shows a schematic perspective top view of a rooting structure according to the invention in a flat state;

Figure 2: shows a schematic perspective side view of the rooting plug structure shown in Figure 1;

Figure 3: shows a schematic perspective top view of the rooting plug structure shown in Figure 1 in a curved state;

Figure 4: shows a schematic cross sectional side view of the rooting plug structure shown in Figure 3, and

Figure 5: shows a flow chart of a method according to the present invention.

Figure 1 shows a schematic perspective top view of a rooting structure according to the present invention in a flat state, while Figure 2 shows a schematic perspective side view of the rooting structure 1 shown in Figure 1. The rooting structure 1 is made from a substrate including organic and/or non-organic material for cultivation of a plant. The substrate may be formed as a composition. Preferably, the composition and/or material is spongy and/or penetrable to growing roots. Such and other suitable substrate materials and/or compositions are known in the
art. For example, the substrate material or composition may comprise organic fibers, e.g. coconut fibre, peat and/or bark. Here, the rooting plug may comprise for instance a substrate composition including particles joined by a bind agent, such as a non-toxic and/or organic glue. The joined particles may e.g. comprise organic fibers and/or soil particles. Preferably, at least a part of the substrate material of the rooting plug is resilient.

The rooting structure 1 having a strip-shaped geometry that is deformable from a flat state into a curved state. Preferably, the strip-shaped geometry can also be deformed back to the flat state. In the flat state, as depicted in Figure 1, the structure 1 generally extends in a flat plane. The strip-shaped geometry has a top surface 4 and a bottom surface 6. In the curved state, the top surface 4 and the bottom surface 6 form a concave side and a convex side, respectively, at least partially surrounding a volume, as also discussed below. The strip-shaped geometry further has a pair of mutually opposite short side edges 11, 12 and a pair of mutually opposite long side edges 13, 14.

The top surface of the strip-shaped geometry has a relief pattern extending between the pair of mutually opposite short side edges 11, 12, thereby reducing mechanical stress in the substrate material when deforming the strip-shaped geometry into the curved state wherein the top surface 4 forms a concave side.

In the embodiment shown in Figure 1, the relief pattern includes a multiple number of grooves 15 extending between the pair of mutually opposite long side edges 13, 14. Due to the absence of material at the locations of the grooves 15 mechanical pressure at the concave side, in the curved state of the strip-shaped geometry, is relatively low or even absent. In the shown embodiment, the grooves extend from a first long side edge 13 to and end at a second long side edge 14, opposite to the first long side edge 13. In principle, the grooves may extend along shorter distance, e.g. without reaching one or both long side edges 13, 14.

The grooves 15 have a depth in the strip-shaped geometry e.g. ranging between circa 10% to circa 90% of the total thickness of the strip-shaped geometry. In the shown embodiment, the grooves 15 are substantially V-shaped. However, other groove shapes could be applied, e.g. a groove having a box-shaped or semi-circular cross section. In the embodiment shown, the grooves 15 are distributed between the pair of mutually opposite short side edges 11, 12 in a substantially uniform manner. Alternatively, the distribution can be non-uniform, e.g. having a higher density of grooves half-way the strip-shaped geometry than near the short side edges 11, 12.

Further, in the show embodiment, the relief pattern includes a multiple number of ridges 16 alternating with the grooves 15, thus forming a staggered, zigzag pattern. Then, between each adjacent grooves 15, a ridge 16 is present. However, between a particular set of adjacent grooves 15 another structure may be present such as a deeper groove. Further, each groove 15 may have the same width or the width groove may deviate from each other.
Advantageously, the ridges 16 may have a particular cross sectional geometry. In a cross section along a first cross section plane S1, through the pair of short side edges 11, 12, the ridges 16 in the shown embodiment have a truncated wedge shaped profile WP forming a toothed contour. In principle, a number or all ridges 16 may have another cross sectional profile, e.g. a triangular profile or a corrugated profile.

As shown in Figure 2, the ridges 16 have, in a cross section along a second cross section plane S2, also shown in Figure 1, through the pair of long side edges 13, 14, a generally straight top edge 17 having a protrusion 18 extending upwardly at a long side 14 of the strip-shaped geometry.

Figure 3 shows a schematic perspective top view of the rooting structure shown in Figure 1 in a curved state. Here, the top surface 4 forms a concave side facing radially inwardly into a volume 20 that is surrounded by the rooting structure 1. Similarly, the bottom surface 6 now forms a convex side facing radially outwardly. As shown in Figure 3, in the curved state, the volumes of the grooves 15 have reduced or are even absent such that side sections of the truncated wedge shaped profiles WP of adjacent ridges contact each other, forming a completely filled annular profile around the volume 20.

In Figure 3, the rooting structure 1 surrounds the volume 20 completely. Generally, the volume 20 is rotationally symmetric. In the shown embodiment, the volume 20 is filled with a separate rooting plug 21 provided with plant material having a root structure 22a and a stem 22b. The separate rooting plug 21 is formed as a mainly cylindrical body though slight tapered.

Figure 4 shows a schematic cross sectional side view of the rooting structure 1 shown in Figure 3. Here, the protrusions 18 extending upwardly at a long side 14 of the strip-shaped geometry, in the flat state of the structure, face and/or abut each other forming a support for the separate rooting plug 21 at least partially surrounded by the rooting structure 1. Further, the protrusions 18 fill a space below the separate rooting plug 21 thereby, for example, reducing a risk of cultivation of larvae that could be harmful for the plant material 22 to be cultivated.

The rooting structure 1 including the separate rooting plug 21 is inserted in a container 23 such as a pot or tray cell.

Referring again to Figure 2, the shown rooting structure 1 has, in a cross section along the second cross section plane S2 through the pair of long side edges 13, 14, a generally straight bottom edge 19 having a beveled edge portion 19a at a long side edge 13 of the strip-shaped geometry. As shown, the protrusion 18 is at a first long side edge 14 of the strip-shaped geometry, while the beveled edge portion 19a is at a second long side edge 13 of the strip-shaped geometry, opposite to the first long side edge 14.
Now referring to Figure 4, it is shown that, in the curved state of the strip-shaped geometry, the second long side edge 13 faces upwardly, substantially parallel to the first long side edge 14 facing downwardly. Further, the generally straight bottom edge 19 now forms a side surface of the wrapped rooting plug structure 1 facing radially outwardly towards a side wall 23a of the container 23. Here, the beveled edge portion 19a inclines from the second long side edge 13 downwardly toward the side wall 23a of the container counteracting that roots of the plant 22 grown above and beyond said side wall 23a. In another embodiment, the rooting plug structure 1 has a straight bottom edge 19 without beveled edge portion 19a, e.g. for application with plant material with roots that always grow downwardly.

As shown in Figure 1, the long side edges 13, 14 of the strip-shaped geometry are both curved having the same curvature orientation, i.e. having a local center of curvature at the same side of the strip-shaped geometry, thereby reducing internal mechanical stress in the structure when the strip-shaped geometry is in the curved state such that the bottom surface 6 forming the concave radial outer side is slightly tapered downwardly towards the first long edge side 14, as shown in Figure 4. It is noted that, in another embodiment, only one long side edge 13, 14 of the pair of long side edges 13, 14 is curved. Then, the other long side edge 14, 13 may be straight. Also, both long side edges 13, 14 can be straight.

By applying the curved rooting plug structure around a separate rooting plug, the volume of an original rooting plug can virtually be enlarged offering the plant material a further stage to further develop.

Figure 5 shows a flow chart of a method 100 according to the invention. The method 100 is used for cultivating plant material, and comprises a step of providing 110 a rooting plug having a side wall and containing a root structure of plant material, a step of providing 120 a rooting structure made from a substrate including organic and/or non-organic material for cultivation of a plant, the structure having a strip-shaped geometry that is deformable from a flat state wherein the structure generally extends in a flat plane to a curved state wherein the structure at least partially surrounds a volume, the strip-shaped geometry having, in its flat state, a pair of mutually opposite short side edges and a pair of mutually opposite long side edges, as well as a bottom surface forming, in its curved state, a convex side, and a top surface forming, in its curved state, a concave side, and wherein the top surface has a relief pattern extending between the pair of mutually opposite short side edges, and a step of wrapping 130 the rooting plug structure around at least a port of the side wall of the rooting plug.

The wrapped rooting plug structure can be placed in a container, or can be kept in the curved state in another way, e.g. by surrounding the plug structure with a strand or by applying a clamp structure to the plug structure.
CLAIMS

1. Rooting structure (1) made from a substrate including organic and/or non-organic material for cultivation of a seedling, young plant or plant (22), the rooting structure (1) having a strip-shaped geometry that is deformable from a flat state wherein the rooting structure (1) generally extends in a flat plane to a curved state wherein the structure surrounds a volume (20) for receiving a rooting plug (21), the strip-shaped geometry having, in its flat state, a pair of mutually opposite short side edges (11, 12) and a pair of mutually opposite long side edges (13, 14), as well as a bottom surface (6) forming, in its curved state, a convex side, and a top surface (4) forming, in its curved state, a concave side, the top surface has a relief pattern extending between the pair of mutually opposite short side edges (11,12) including a multiple number of grooves (15) extending between the pair of mutually opposite long side edges and the relief pattern further includes a multiple number of ridges (16) alternating with the grooves characterized in that the multiple number of ridges (16) have, in a cross section (S2) through the pair of long side edges (13, 14), a generally straight top edge (17) having a protrusion (18) extending upwardly at a long side edge (14) of the strip-shaped geometry.

2. Rooting structure (1) according to claim 1, characterized in that the rooting structure has, in a cross section (S2) through the pair of long side edges (13, 14), a generally straight bottom edge (19) having a beveled edge portion (19a) at a long side edge (13) of the strip-shaped geometry opposite to the first long side edge (14).

3. Rooting structure (1) according to claim 1 or claim 2, characterized in that the grooves (15) are substantially V-shaped.

4. Rooting structure (1) according to any one of the claims 1 to 3, characterized in that the grooves (15) are distributed between the pair of mutually opposite short sides edges (11, 12) in a substantially uniform manner.

5. Rooting structure (1) according to any one of the claims 1 to 4, characterized in that a ridge (16) of the multiple number of ridges has, in a cross section through the pair of short side edges (11,12) , a truncated wedge shaped profile.

6. Rooting structure (1) according to any one of the claims 2 to 5, characterized in that the protrusion (18) is at a first long side edge (14) of the strip-shaped geometry and wherein the beveled edge portion (19a) is at a second long side edge (13) of the strip-shaped geometry.
7. Rooting structure (1) according to any one of the claims 1 to 6, characterized in that at least one long side edge of the pair of long side edges (13, 14) of the strip-shaped geometry is curved.

8. Rooting structure (1) according to any one of the claims 1 to 7, characterized in that the strip-shaped geometry in the curved state surrounds a separate rooting plug (21).

9. Container (23) comprising a rooting structure (1) according to any one of the claims 1 to 8, further comprising a separate rooting plug (21) that is at least partially or completely surrounded by the rooting structure (1).

10. Container according to claim 9, wherein the rooting plug (21) comprises a seedling, young plant or plant (22), preferably an orchid.

11. Method for cultivating a seedling, young plant or plant (22), comprising the steps of:
   a) providing a rooting plug (21) having a side wall and containing a root (22A) of a seedling, young plant or plant (22), preferably an orchid;
   b) providing a rooting structure (1) according to any one of the claims 1 to 8; and
   c) wrapping the rooting structure (1) around the side wall of the rooting plug (21) along the at least partially the side walls of the rooting plug (21) or folding the rooting structure (1) and placing the rooting plug (21) in the resulting volume (20).
FIG. 5

PROVIDING A ROOTING PLUG

PROVIDING A ROOTING PLUG STRUCTURE

WRAPPING THE ROOTING PLUG STRUCTURE
A. CLASSIFICATION OF SUBJECT MATTER
INV. A01G24/44
ADD.

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)
A01G

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

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

<table>
<thead>
<tr>
<th>Category</th>
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<th>Relevant to claim No.</th>
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<tbody>
<tr>
<td>A</td>
<td>EP 3 000 314 A1 (EDC HORTI SERVICES B V [NL]) 30 March 2016 (2016-03-30) abstract; claim 1; figures 1-3</td>
<td>1-11</td>
</tr>
<tr>
<td>A</td>
<td>EP 2 572 571 A1 (MAX ROOTS B V [NL]) 27 March 2013 (2013-03-27) abstract; figure 1</td>
<td>1,11</td>
</tr>
<tr>
<td>A</td>
<td>EP 0 172 060 A2 (CHALLET HERAUT CREATIONS [FR]) 19 February 1986 (1986-02-19) abstract; figures 1,2</td>
<td>1,11</td>
</tr>
<tr>
<td>A</td>
<td>NL 1 002 139 C2 (MARSMA HOLDING B V [NL]) 25 July 1997 (1997-07-25) abstract; figures 1-4</td>
<td>1,11</td>
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Further documents are listed in the continuation of Box C.

See patent family annex.

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Date of the actual completion of the international search: 23 July 2019
Date of mailing of the international search report: 30/07/2019

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<th>Category</th>
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<th>Relevant to claim No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>DE 20 2018 100737 U1 (DUEMMEN GROUP BV [NL]) 24 April 2018 (2018-04-24) paragraphs [0021], [0022], [0043]; figures 1-4</td>
<td>1,11</td>
</tr>
<tr>
<td>A</td>
<td>US 3 513 593 A (BECK GAIL EDWIN) 26 May 1970 (1970-05-26) column 3, line 19 - column 4, line 26; figures 2-6</td>
<td>1,11</td>
</tr>
<tr>
<td>Patent document cited in search report</td>
<td>Publication date</td>
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<td>EP 3000314 A1</td>
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<td>US 2016088803 A1</td>
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<td></td>
<td>NL 2007469 C2</td>
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<tr>
<td>EP 0172060 A2</td>
<td>19-02-1986</td>
<td>DK 306485 A</td>
</tr>
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<td>EP 0172060 A2</td>
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<tr>
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<td>JP S61181320 A</td>
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<tr>
<td>NL 1002139 C2</td>
<td>25-07-1997</td>
<td>NONE</td>
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<tr>
<td>DE 202018100737 U1</td>
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<td>NONE</td>
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<td>26-05-1970</td>
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