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(54) **POINT DRAIN**

PUNKTUELLE DRAINAGE

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Description

[0001] The present invention relates to a method of draining water, the use of a point drain and a method of installing a point drain.

[0002] Precipitation such as rain, snow, sleet, hail and the like results in surface water which can cause the ground to become waterlogged.

[0003] It is known to install gravel in waterlogged areas to aid water drainage. A hole is dug in the ground, and gravel is placed in the hole and covered with earth. The gravel aids the drainage of the area, as the spaces between the gravel can hold water and allow water to drain through the gravel. The capacity of the gravel to hold water is limited by the available space between the particles of gravel. Over time, there is a risk that the gravel may become mixed with the surrounding earth and the spaces between some of the particles of gravel may become filled with earth, reducing the water draining capacity of the installation.

[0004] It is also known to spike waterlogged areas and to fill the resulting holes with coarse sand. The coarse sand aids the drainage of the area as the spaces between the sand can hold water and allow water to drain through the sand. The capacity of the sand to hold water is limited by the available space between the particles of sand. Over time, there is a risk that the sand may become mixed with the surrounding earth and some of the spaces between the particles of sand may become filled with earth, reducing the water draining capacity of the installation.

[0005] It also known to install capillary layers in the ground to aid drainage. These layers may be formed from stone, gravel, sand and earth arranged to maximise the drainage of the ground. It is time-consuming to install the various layers in the ground. Over time, there is a risk that the different layers may become mixed with each other and the surrounding earth, and the spaces between some of the particles of stone, gravel and sand may become filled with earth, thereby reducing the water draining capacity of the installation. This is expensive as the area needing to be drained has to be excavated and replaced with stone, gravel and sand.

[0006] Drainage systems are known whereby the collected water is actively pumped away into a water store or disposed of via mains drainage. DE3815443 discloses a drainpipe with apertures and any number of absorbent rollers fixed onto the pipe. The rollers are made of rock wool or glass wool. The rollers are not continuous along the pipe and there are sections in which the drainpipe with apertures is exposed to the earth. One disadvantage of this is that earth can reduce the usable width of the pipe, or even block the pipe completely as a result of earth entering the pipe via the apertures in the areas in which there is no roller. This solution requires the water to be pumped away from the ground.

[0007] Prior art makes use of gravel which surrounds drainpipes of this type having apertures, creating an area around the drainpipe where water can run freely towards

the drainpipe, and which can then be pumped away. However, the capacity of gravel to hold water is limited to the space available between the pieces of gravel. This solution also requires the additional step in which the water is pumped away from the ground.

[0008] EP 1 038 433 A discloses a use of a vitreous material as a substrate for cultivation wherein the material is based on polyester resin.

[0009] There is a need for a drain that can absorb water from the ground and store the water until it can be dissipated back to the ground. Further, there is a need to improve the storage capability of a drain so that the drain stores more water per unit volume. Further there is a need to increase the buffering capacity of such a drain, that is the difference between the maximum amount of water that can be held by the drain, and the amount of water that is retained when the drain device gives off water. Further there is a need for a drain that does not become contaminated with earth from the ground. There is a need for a drain that will stay in place for several years without the need for replacement. It is also desirable to provide such a drain device which is environmentally acceptable and economical in terms of its production, installation and use. The present invention solves the above detailed problem.

Summary of Invention

[0010] In a first aspect of the invention, there is provided a method of draining water comprising providing a point drain formed of a man-made vitreous substrate (MMVF substrate), wherein the MMVF substrate comprises man-made vitreous fibres bonded with a cured binder composition, wherein the point drain has a longitudinal axis which is parallel to the longest side of the point drain, positioning the point drain in the ground so that the longitudinal axis is directed downwardly, whereby water which is in fluid communication with the point drain is absorbed by the MMVF substrate, wherein water is dissipated by the MMVF substrate into the ground.

[0011] In a second aspect of the invention, there is provided a use of a point drain formed of a man-made vitreous substrate (MMVF substrate), wherein the MMVF substrate comprises man-made vitreous fibres bonded with a cured binder composition, wherein the point drain has a longitudinal axis which is parallel to the longest side of the point drain, positioning the point drain in the ground so that the longitudinal axis is directed downwardly, whereby water which is in fluid communication with the point drain is absorbed by the MMVF substrate, wherein water is dissipated by the MMVF substrate into the ground.

[0012] In a third aspect of the invention, there is provided a method of installing a point drain comprising providing a hole in the ground, positioning a point drain formed of a man-made vitreous substrate (MMVF substrate), wherein the MMVF substrate comprises man-made vitreous fibres bonded with a cured binder compo-

sition, wherein the point drain has a longitudinal axis which is parallel to the longest side of the point drain, positioning the point drain in the ground so that the longitudinal axis is directed downwardly.

Detailed description of the invention

[0013] MMVF substrates are known for numerous purposes, including for sound and thermal insulation, fire protection and in the field of growing plants. When used for growing plants, the MMVF substrate absorbs water to allow plants to grow. When used for growing plants, it is important that the MMVF substrate does not dry out. In the field of growing plants, an MMVF substrate is normally used instead of soil to grow plants. The relative capillarity of soil and an MMVF substrate is not important in the field of growing plants. WO01/23681 discloses the use of MMVF substrate as a sewage filter.

[0014] The present invention provides the use of a MMVF substrate as a point drain. The man-made vitreous fibres are bonded with cured binder composition and the point drain can retain water within its open pore structure.

[0015] The man-made vitreous fibres (MMVF) can be glass fibres, ceramic fibres, basalt fibres, slag wool, stone wool and others, but are usually stone wool fibres. Stone wool generally has a content of iron oxide at least 3 % and content of alkaline earth metals (calcium oxide and magnesium oxide) from 10 to 40 %, along with the other usual oxide constituents of MMVF. These are silica; alumina; alkali metals (sodium oxide and potassium oxide) which are usually present in low amounts; and can also include titania and other minor oxides.

[0016] Fibre diameter is often in the range of 3 to 20 μm , such as 3 to 5 μm .

[0017] The MMVF substrate is in the form of a coherent mass. That is, the MMVF substrate is generally a coherent matrix of MMVF fibres, which has been produced as such, but can also be formed by granulating a slab of MMVF and consolidating the granulated material. The binder may be any of the binders known for use as binders for coherent MMVF products. The MMVF substrate may comprise a wetting agent.

[0018] Preferably the point drain is formed of a single unitary MMVF substrate. The advantage of using a unitary MMVF substrate is that water can easily be absorbed throughout the entire volume of the MMVF substrate because there is no barrier between the edges of MMVF substrates.

[0019] The point drain may comprise more than one MMVF substrate, for instance 2-10 MMVF substrates, preferably 2-5 MMVF substrates, more preferably 3-4 MMVF substrates. Where more than one MMVF substrate is used, the MMVF substrates are each in fluid communication with each other. An advantage of the point drain comprising more than one MMVF substrate is that the size and shape of the point drain can be easily tailored to the requirements of the waterlogged ground

without the need to generate multiple shapes and sizes of substrate. A greater number of MMVF substrates of a given volume will have more capacity to drain water from the ground than a single MMVF substrate of that same volume.

[0020] The point drain may comprise granular MMVF substrates. Each granule may be 1-5 cm^3 in volume, preferably 1-4 cm^3 , more preferably 1-2 cm^3 . The granules can be in the form of cylinders, cuboids or they may be irregularly shaped such as flocks. An advantage of providing the MMVF substrate in granular form is that the size of the point drain can be easily tailored to the requirements of the waterlogged ground. A greater amount of granular MMVF substrate will have more capacity to drain water from the ground than less granular MMVF substrate.

[0021] The MMVF substrate is hydrophilic, that is it attracts water. The MMVF substrate is hydrophilic due to the binder system used. In the binder system, the binder itself may be hydrophilic and/or a wetting agent used.

[0022] The hydrophilicity of a sample of MMVF substrate can be measured by determining the sinking time of a sample. A sample of MMVF substrate having dimensions of 100x100x65 mm is required for determining the sinking time. Where the MMVF substrate is granular, a cage having these dimensions could be used to provide a sample of the required size for testing. A container with a minimum size of 200x200x200 mm is filled with water. The sinking time is the time from when the sample first contacts the water surface to the time when the test specimen is completely submerged. The sample is placed in contact with the water in such a way that a cross-section of 100x100 mm first touches the water. The sample will then need to sink a distance of just over 65mm in order to be completely submerged. The faster the sample sinks, the more hydrophilic the sample is. The MMVF substrate is considered hydrophilic if the sinking time is less than 120 s. Preferably the sinking time is less than 60 s. In practice, the MMVF substrate may have a sinking time of a few seconds, such as less than 10 seconds.

[0023] When the binder is hydrophobic, in order to ensure that the substrate is hydrophilic, a wetting agent is additionally included in the MMVF substrate. A wetting agent will increase the amount of water that the MMVF substrate can absorb. The use of a wetting agent in combination with a hydrophobic binder results in a hydrophilic MMVF substrate. The wetting agent may be any of the wetting agents known for use in MMVF substrates that are used as growth substrates. For instance it may be a non-ionic wetting agent such as Triton X-100 or Rewopal. Some non-ionic wetting agents may be washed out of the MMVF substrate over time. It is therefore preferable to use an ionic wetting agent, especially an anionic wetting agent, such as linear alkyl benzene sulphonate. These do not wash out of the MMVF substrate to the same extent.

[0024] EP1961291 discloses a method for producing water-absorbing fibre products by interconnecting fibres

using a self-curing phenolic resin and under the action of a wetting agent, characterised in that a binder solution containing a self-curing phenolic resin and polyalcohol is used. This type of binder can be used in the present invention. Preferably, in use the wetting agent does not become washed out of the MMVF substrate and therefore does not contaminate the surrounding ground.

[0025] The binder of the MMVF substrate can be hydrophilic. A hydrophilic binder does not require the use of a wetting agent. A wetting agent can nevertheless be used to increase the hydrophilicity of a hydrophilic binder in a similar manner to its action in combination with a hydrophobic binder. This means that the MMVF substrate will absorb a higher volume of water than if the wetting agent is not present. Any hydrophilic binder can be used.

[0026] The binder may be a formaldehyde-free aqueous binder composition comprising: a binder component (A) obtainable by reacting at least one alkanolamine with at least one carboxylic anhydride and, optionally, treating the reaction product with a base; and a binder component (B) which comprises at least one carbohydrate, as disclosed in WO2004/007615. Binders of this type are hydrophilic.

[0027] WO97/07664 discloses a hydrophilic substrate that obtains its hydrophilic properties from the use of a furan resin as a binder. The use of a furan resin allows the abandonment of the use of a wetting agent. Binders of this type may be used in the present invention.

[0028] WO07129202 discloses a hydrophilic curable aqueous composition wherein said curable aqueous composition is formed in a process comprising combining the following components:

- (a) a hydroxy-containing polymer,
 - (b) a multi-functional crosslinking agent which is at least one selected from the group consisting of a polyacid, salt(s) thereof and an anhydride, and
 - (c) a hydrophilic modifier;
- wherein the ratio of (a):(b) is from 95:5 to about 35:65.

[0029] The hydrophilic modifier can be a sugar alcohol, monosaccharide, disaccharide or oligosaccharide. Examples given include glycerol, sorbitol, glucose, fructose, sucrose, maltose, lactose, glucose syrup and fructose syrup. Binders of this type can be used in the present invention.

[0030] Further, a binder composition comprising:

- a) a sugar component, and
 - b) a reaction product of a polycarboxylic acid component and an alkanolamine component,
- wherein the binder composition prior to curing contains at least 42% by weight of the sugar component based on the total weight (dry matter) of the binder components may be used in the present invention,

preferably in combination with a wetting agent.

[0031] Binder levels are preferably in the range 0.5 to 5 wt%, preferably 2 to 4 wt%, based on the weight of the MMVF substrate.

[0032] Levels of wetting agent are preferably in the range 0 to 1 wt%, based on the weight of the MMVF substrate, in particular in the range 0.2 to 0.8 wt%, especially in the range 0.4 to 0.6 wt%.

[0033] The MMVF product may be made by any of the methods known to those skilled in the art for production of MMVF growth substrate products. In general, a mineral charge is provided, which is melted in a furnace to form a mineral melt. The melt is then formed into fibres by means of centrifugal fiberisation e.g. using a spinning cup or a cascade spinner, to form a cloud of fibres. These fibres are then collected and consolidated. Binder and optionally wetting agent are usually added at the fiberisation stage by spraying into the cloud of forming fibres. These methods are well known in the art.

[0034] The MMVF substrate used as a point drain in the present invention preferably has a density in the range of 60 to 200 kg/m³, preferably in the range of 75 to 150 kg/m³, such as around 80 kg/m³.

[0035] The advantage of density in this range is that the MMVF substrate has a relatively high compression strength. This is important because the MMVF substrate may be installed in a position where people or vehicles need to travel over the ground in which the MMVF substrate is positioned. Optionally, a force distribution plate is positioned on top of the MMVF substrate in order to distribute the force upon the MMVF substrate. Preferably such a force distribution plate is not required due to the density of the MMVF substrate.

[0036] The longitudinal axis is parallel to the longest side of the point drain. The longest width is the longest part of the point drain that is perpendicular to the longitudinal axis. The ratio of the longest side of the point drain to the longest width is preferably in the range 50:1 to 2:1, more preferably 30:1 to 4:1, most preferably in the range 20:1 to 5:1.

[0037] The cross-sectional area of the point drain perpendicular to the longest side is preferably in the range 100 to 2,500 cm². The advantage of using a point drain having a cross-sectional area in this range is that it is large enough to buffer a large amount of water. The cross-sectional area of the point drain makes it easy to install underground as the cross-section of the hole only needs to be slightly wider than the cross-section of the point drain. The point drain may optionally be of greater size, but this will increase the effort required to install the point drain.

[0038] The length of the point drain may be any length, but will normally be in the range of 50 cm to 200 cm, preferably 75 to 125 cm. The point drain is long and narrow in order to reduce the effect of the MMVF substrate on the surface of the ground.

[0039] Several point drains may be installed spaced

apart from each other so as to cover a larger area, depending on the volume of water to be managed. The point drains are preferably arranged so that the longitudinal axes are parallel. Using several point drains will mean that a greater volume of water can be handled, compared to using a single point drain.

[0040] It is however envisaged that the length and the cross-sectional area of the point drain will be sufficient such that it will not be necessary to install several parallel point drains.

[0041] The volume of the point drain is preferably in the range 5000 to 500,000 cm³, more preferably 40,000 to 135,000 cm³. The precise volume is chosen according to the volume of water which is expected to be managed.

[0042] Preferably the point drain has a circular cross-section which makes it easy to manufacture and install in the hole made with a drilling rig. Alternatively the cross-section may be rectangular, triangular or any convenient shape.

[0043] Preferably the cross-sectional area of the point drain is substantially uniform along the length. Substantially uniform means that the cross-sectional area at all points along the length remains within 10 % of the average cross-sectional area, preferably within 5 %, most preferably within 1 %.

[0044] Preferably the water holding capacity of the MMVF substrate is at least 80 % of the volume of the substrate, preferably 80-99 %, most preferably 85-95 %. The greater the water holding capacity, the more water can be stored for a given substrate volume. The water holding capacity of the MMVF substrate is high due to the open pore structure and the MMVF substrate being hydrophilic.

[0045] Preferably the amount of water that is retained by the MMVF substrate when it emits water is less than 20 %vol, preferably less than 10 %vol, most preferably less than 5%vol. based on the volume of the substrate. The water retained may be 2 to 20 %vol, such as 5 to 10 %vol. The lower the amount of water retained by the MMVF substrate, the greater the capacity of the MMVF substrate to take on more water. Water may leave the MMVF substrate by dissipating into the ground when the surrounding ground is dry and the capillary balance is such that the water dissipates into the ground.

[0046] Preferably the buffering capacity of the MMVF substrate, that is the difference between the maximum amount of water that can be held, and the amount of water that is retained when the MMVF substrate gives off water is at least 60 %vol, preferably at least 70 %vol, preferably at least 80 %vol, based on the volume of the substrate. The buffering capacity may be 60 to 90 %vol, such as 60 to 85 %vol. The advantage of such a high buffering capacity is that the MMVF substrate can buffer more water for a given substrate volume, that is the MMVF substrate can store a high volume of water when required, and release a high volume of water into the surrounding ground when the ground has dried out. The buffering capacity is so high because MMVF substrate

requires a low suction pressure to remove water from the MMVF substrate. This is demonstrated in the Example.

[0047] The water holding capacity, the amount of water retained and the buffering capacity of the MMVF substrate can each be measured in accordance with EN 13041 -1999.

[0048] The present invention relates to a method of draining water comprising providing a point drain formed of a man-made vitreous substrate (MMVF substrate), wherein the MMVF substrate comprises man-made vitreous fibres bonded with a cured binder composition, wherein the point drain has a longitudinal axis which is parallel to the longest side of the point drain, positioning the point drain in the ground so that the longitudinal axis is directed downwardly, whereby water which is in fluid communication with the point drain is absorbed by the MMVF substrate, wherein water is dissipated by the MMVF substrate into the ground.

[0049] The MMVF substrate is positioned so that the longitudinal axis is directed downwardly in the ground. 'Downwardly' means the longitudinal axis of the point drain is positioned less than 20° from vertical, such as less than 10° from vertical, preferably less than 5° from vertical, more preferably less than 2° from vertical, most preferably vertical. The MMVF substrate is preferably buried within the ground. Preferably the MMVF substrate is completely covered with earth. Earth includes sediment, sand, clay, dirt, gravel and the like. For example, in waterlogged areas the MMVF substrate may be buried under 1 to 20 cm of earth, more preferably 2-10 cm of earth, i.e. the depth of the layer of earth above the point drain.

[0050] An advantage of using the point drain according to the invention is that the point drain can absorb water and store it within its open pore structure. The point drain can store water when required, and also dissipate water back to the ground when required. An advantage of storing the water is that when the surrounding ground is dry enough, the water stored in the MMVF substrate can dissipate from the substrate into the ground. This means that it is not necessary to take active steps to remove the water and arrange to dispose of it. The point drain can store the water and then gradually dissipate it to the ground when the capillary balance between the MMVF substrate and the ground allows the water to dissipate into the ground.

[0051] The point drain is intended as a 'DIY' solution to waterlogged ground, preventing the need for more costly construction methods to be carried out.

[0052] It is not necessary to wrap the point drain of the present invention in any geo-textile material on installation because the MMVF substrate acts like a filter itself in order to prevent any contaminant such as earth entering the point drain.

[0053] The MMVF substrate will be installed in such a way as to drain waterlogged ground, particularly when precipitation such as rain, snow, sleet, hail and the like results in surface water which causes the ground to be-

come waterlogged. This can commonly occur near to buildings, particularly where a portion of the surrounding ground is covered by buildings, paving, tarmac or other non-water-permeable surfaces without adequate drainage. If there is not adequate drainage, this puts pressure on the ground surrounding this area to dissipate the surface water that has accumulated. This results in the surrounding area becoming waterlogged and needing to be drained.

[0054] The point drain of the present invention can be used to drain the waterlogged ground by absorbing the excess water into the open pore structure of the MMVF substrate and storing the water until the ground dries out and then gradually dissipating the water to the ground. If there is a low level of excess water in the ground, the MMVF substrate can store this excess water until the ground is dry enough to dissipate the water back to the ground.

[0055] There is provided a use of a point drain formed of a man-made vitreous substrate (MMVF substrate), wherein the MMVF substrate comprises man-made vitreous fibres bonded with a cured binder composition, wherein the point drain has a longitudinal axis which is parallel to the longest side of the point drain, positioning the point drain in the ground so that the longitudinal axis is directed downwardly, whereby water which is in fluid communication with the point drain is absorbed by the MMVF substrate, wherein water is dissipated by the MMVF substrate into the ground.

[0056] There is provided a method of installing a point drain comprising providing a hole in the ground, positioning a point drain formed of a man-made vitreous substrate (MMVF substrate), wherein the MMVF substrate comprises man-made vitreous fibres bonded with a cured binder composition, wherein the point drain has a longitudinal axis which is parallel to the longest side of the point drain, positioning the point drain in the ground so that the longitudinal axis is directed downwardly.

[0057] The point drain is then preferably covered with earth so that the point drain is completely buried in the ground.

[0058] The preferred method of drilling the hole is with the use of a drilling rig. The hole need only be between 2 to 10 cm larger in diameter, than the point drain, ensuring that it is large enough for the point drain to be inserted.

[0059] Where the point drain comprises granular MMVF substrate, the granular MMVF substrate may be placed in a water permeable casing, such as a plastic or metal mesh to define the size of the point drain. The advantage of this is that the size of the point drain can be determined on site, and the water permeable casing allows the installer to control placing the point drain in the hole.

[0060] Alternatively, where the point drain comprises granular MMVF substrate, the granular MMVF substrate may be poured into the hole. The size of the hole and the depth that the hole is filled with MMVF substrate de-

finer the size of the point drain. This has the advantage that the size of the point drain can be determined on site.

[0061] Where the point drain comprises granular MMVF substrate, the size of the hole will define the size of the point drain.

Brief description of figures

[0062]

Figure 1 shows a cross-sectional view of waterlogged ground

Figure 2 shows a cross-sectional view of point drain installed in the ground

Figure 3 shows a cross-sectional view of an alternative point drain installed in the ground

Figure 4 shows a cross-sectional view of a point drain being installed in the ground

Figure 5 shows a perspective view of a cylindrical point drain

Figure 6 shows the water holding capacity of an MMVF substrate according to the invention as discussed in the Example

Detailed description of figures

[0063] Figure 1 shows waterlogged ground. The ground 1 is not able to dissipate rain water and so a puddle 2 is formed.

[0064] Figure 2 shows a point drain 3a installed in the ground 1a. The point drain comprises a single MMVF substrate buried in the ground with the longest side of the point drain downwards. No puddle is formed as the point drain absorbs the excess water when the ground is waterlogged and dissipates the water back to the ground once the ground has dried out. The longitudinal axis 5a is shown parallel to the longest side of the point drain.

[0065] Figure 3 shows a point drain 3b installed in the ground 1b. The point drain comprises granular MMVF substrate. The granular MMVF substrate is buried in the ground. The longest side of the point drain is downwards. No puddle is formed as the point drain absorbs the excess water when the ground is waterlogged and dissipates the water back to the ground once the ground has dried out. The longitudinal axis 5b is shown parallel to the longest side of the point drain.

[0066] Figure 4 shows a point drain 3c being installed in the ground 1c. The point drain is being lowered into a hole 4. After installation, the space left in the hole 4 will be filled with earth. The longitudinal axis 5c is shown parallel to the longest side of the point drain.

[0067] Figure 5 shows a preferred embodiment of a MMVF substrate 3d with a circular cross section. The longitudinal axis 5d of the point drain 3d and the cross-sectional area 6d perpendicular to the longitudinal axis 5d are shown. The longest width 7d is shown as the longest part of the cross-sectional area.

[0068] The invention will now be described in the following example which does not limit the scope of the invention.

Example

[0069] The water holding capacity of a MMVF substrate and silt loam were tested in accordance with EN 13041 - 1999. The MMVF substrate was a stone wool fibre product with a phenol-urea formaldehyde (PUF) binder and a non-ionic surfactant wetting agent. The results are shown in Figure 6.

[0070] The MMVF substrate has a maximum water content of 90 %vol based on the substrate volume. When the MMVF substrate gives off water, it retains about 2-5 %vol of water. This means that the MMVF substrate has a buffering capacity of 85-87 %vol. This shows that the MMVF substrate has a high maximum water content, as well as a lower water retention level.

[0071] The maximum water content of the silt loam is lower than the MMVF substrate. The capillarity of the silt loam is much higher than that of the MMVF substrate, which means a suction pressure of several meters is required in order to withdraw water from the silt loam. This means that the soil will easily drain water from the MMVF substrate as soon as the soil is not saturated.

Claims

1. A method of draining water comprising providing a point drain formed of a man-made vitreous substrate (MMVF substrate), wherein the MMVF substrate comprises man-made vitreous fibres bonded with a cured binder composition, wherein the point drain has a longitudinal axis which is parallel to the longest side of the point drain, positioning the point drain in the ground so that the longitudinal axis is directed downwardly, whereby water which is in fluid communication with the point drain is absorbed by the MMVF substrate, wherein water is dissipated by the MMVF substrate into the ground.
2. A method according to any preceding claim wherein the volume of the point drain is in the range 5,000 to 500,000 cm³, preferably 40,000 to 135,000 cm³.
3. A method according to any preceding claim, wherein the MMVF substrate has a density in the range 60 to 200 kg/m³, preferably in the range 75 to 150 kg/m³.
4. A method according to any preceding claim wherein the longest side of the point drain is in the range 50 to 200 cm, preferably 75 to 125 cm.
5. A method according to any preceding claim wherein the point drain has a circular cross-sectional area.

6. A method according to any preceding claim, wherein the cross-sectional area perpendicular to the longest side of the point drain is between 100 and 2,500 cm².
7. A method according to any preceding claim, wherein the point drain is positioned 1 to 20 cm, preferably 2 to 10 cm below the surface of the ground.
8. A method according to any preceding claim, wherein the MMVF substrate comprises a wetting agent.
9. A method according to any preceding claim, wherein the point drain comprises granular MMVF substrate.
10. Use of a point drain formed of a man-made vitreous substrate (MMVF substrate), wherein the MMVF substrate comprises man-made vitreous fibres bonded with a cured binder composition, wherein the point drain has a longitudinal axis which is parallel to the longest side of the point drain, positioning the point drain in the ground so that the longitudinal axis is directed downwardly, whereby water which is in fluid communication with the point drain is absorbed by the MMVF substrate, wherein water is dissipated by the MMVF substrate into the ground.
11. Use according to claim 10, further comprising any of the features of claims 2-9.
12. A method of installing a point drain comprising providing a hole in the ground, positioning a point drain formed of a man-made vitreous substrate (MMVF substrate), wherein the MMVF substrate comprises man-made vitreous fibres bonded with a cured binder composition, wherein the point drain has a longitudinal axis which is parallel to the longest side of the point drain, positioning the point drain in the ground so that the longitudinal axis is directed downwardly.
13. A method according to claim 11, wherein the hole is provided by using a drilling rig.

Patentansprüche

1. Verfahren zum Ablassen von Wasser, umfassend das Bereitstellen einer punktuellen Drainage, die aus einem synthetischen Glassubstrat (MMVF-Substrat) ausgebildet ist, wobei das MMVF-Substrat mit einer ausgehärteten Bindemittelzusammensetzung verbundene synthetische Glasfasern umfasst, wobei die punktuelle Drainage eine Längsachse aufweist, die parallel zur längsten Seite der punktuellen Drainage liegt, wodurch die punktuelle Drainage im Boden positioniert wird, sodass die Längsachse nach unten gerichtet ist, wodurch in Fluidverbindung mit der punktuellen Drainage stehendes Wasser

durch das MMVF-Substrat absorbiert wird, wobei Wasser durch das MMVF-Substrat an den Boden abgegeben wird.

2. Verfahren nach einem der vorhergehenden Ansprüche, wobei das Volumen der punktuellen Drainage im Bereich 5.000 bis 500.000 cm³, vorzugsweise 40.000 bis 135.000 cm³ liegt. 5
3. Verfahren nach einem der vorhergehenden Ansprüche, wobei das MMVF-Substrat eine Dichte im Bereich 60 bis 200 kg/m³, vorzugsweise im Bereich 75 bis 150 kg/m³ aufweist. 10
4. Verfahren nach einem der vorhergehenden Ansprüche, wobei die längste Seite der punktuellen Drainage im Bereich 50 bis 200 cm, vorzugsweise 75 bis 125 cm liegt. 15
5. Verfahren nach einem der vorhergehenden Ansprüche, wobei die punktuelle Drainage eine kreisförmige Querschnittsfläche aufweist. 20
6. Verfahren nach einem der vorhergehenden Ansprüche, wobei die Querschnittsfläche senkrecht zur längsten Seite der punktuellen Drainage zwischen 100 und 2.500 cm² beträgt. 25
7. Verfahren nach einem der vorhergehenden Ansprüche, wobei die punktuelle Drainage 1 bis 20 cm, vorzugsweise 2 bis 10 cm unter der Bodenoberfläche positioniert ist. 30
8. Verfahren nach einem der vorhergehenden Ansprüche, wobei das MMVF-Substrat ein Benetzungsmittel umfasst. 35
9. Verfahren nach einem der vorhergehenden Ansprüche, wobei die punktuelle Drainage ein körniges MMVF-Substrat umfasst. 40
10. Gebrauch einer punktuellen Drainage, die aus einem synthetischen Glassubstrat (MMVF-Substrat) ausgebildet ist, wobei das MMVF-Substrat synthetische Glasfasern umfasst, die mit einer ausgehärteten Bindemittelzusammensetzung verbunden sind, wobei die punktuelle Drainage eine Längsachse aufweist, die parallel zur längsten Seite der punktuellen Drainage liegt und die punktuelle Drainage im Boden positioniert, sodass die Längsachse nach unten gerichtet ist, wodurch in Fluidverbindung mit der punktuellen Drainage stehendes Wasser durch das MMVF-Substrat absorbiert wird, wobei Wasser durch das MMVF-Substrat an den Boden abgegeben wird. 45 50 55
11. Gebrauch nach Anspruch 10, ferner eines der Merkmale aus den Ansprüchen 2-9 umfassend.

12. Verfahren zum Einbauen einer punktuellen Drainage, umfassend ein Bereitstellen eines Lochs im Boden, Positionieren einer punktuellen Drainage, die aus einem synthetischen Glassubstrat (MMVF-Substrat) ausgebildet ist, wobei das MMVF-Substrat synthetische Glasfasern umfasst, die mit einer ausgehärteten Bindemittelzusammensetzung verbunden sind, wobei die punktuelle Drainage eine Längsachse aufweist, die parallel zur längsten Seite der punktuellen Drainage liegt, Positionieren der punktuellen Drainage im Boden, sodass die Längsachse nach unten gerichtet ist.

13. Verfahren nach Anspruch 11, wobei das Loch unter Verwendung eines Bohrturms bereitgestellt wird.

Revendications

1. Procédé de drainage de l'eau comprenant la fourniture d'un drain ponctuel constitué d'un substrat vitreux artificiel (substrat MMVF), où le substrat MMVF comprend des fibres vitreuses artificielles liées avec une composition liante durcie, où le drain ponctuel a un axe longitudinal qui est parallèle au côté le plus long du drain ponctuel, le positionnement du drain ponctuel dans le sol de sorte que l'axe longitudinal est dirigé vers le bas, moyennant quoi l'eau qui est en communication fluide avec le drain ponctuel est absorbée par le substrat MMVF, où l'eau est dissipée par le substrat MMVF dans le sol.
2. Procédé selon l'une quelconque des revendications précédentes, dans lequel le volume du drain ponctuel est compris entre 5 000 et 500 000 cm³, de préférence entre 40 000 et 135 000 cm³.
3. Procédé selon l'une quelconque des revendications précédentes, dans lequel le substrat MMVF a une densité comprise entre 60 et 200 kg/m³, de préférence entre 75 et 150 kg/m³.
4. Procédé selon l'une quelconque des revendications précédentes, dans lequel le côté le plus long du drain ponctuel est compris entre 50 et 200 cm, de préférence entre 75 et 125 cm.
5. Procédé selon l'une quelconque des revendications précédentes, dans lequel le drain ponctuel a une section transversale circulaire.
6. Procédé selon l'une quelconque des revendications précédentes, dans lequel la section transversale perpendiculaire au côté le plus long du drain ponctuel est comprise entre 100 et 2 500 cm².
7. Procédé selon l'une quelconque des revendications précédentes, dans lequel le drain ponctuel est posi-

tionné entre 1 et 20 cm, de préférence entre 2 et 10 cm en dessous de la surface du sol.

8. Procédé selon l'une quelconque des revendications précédentes, dans lequel le substrat MMVF comprend un agent mouillant. 5
9. Procédé selon l'une quelconque des revendications précédentes, dans lequel le drain ponctuel comprend un substrat MMVF granulaire. 10
10. Utilisation d'un drain ponctuel constitué d'un substrat vitreux artificiel (substrat MMVF), où le substrat MMVF comprend des fibres vitreuses artificielles liées avec une composition liante durcie, où le drain ponctuel a un axe longitudinal qui est parallèle au côté le plus long du drain ponctuel, le positionnement du drain ponctuel dans le sol de sorte que l'axe longitudinal est dirigé vers le bas, moyennant quoi l'eau qui est en communication fluide avec le drain ponctuel est absorbée par le substrat MMVF, où l'eau est dissipée par le substrat MMVF dans le sol. 15
20
11. Utilisation selon la revendication 10, comprenant en outre l'une quelconque des caractéristiques des revendications 2 à 9. 25
12. Procédé d'installation d'un drain ponctuel comprenant la réalisation d'un trou dans le sol, le positionnement d'un drain ponctuel constitué d'un substrat vitreux artificiel (substrat MMVF), où le substrat MMVF comprend des fibres vitreuses artificielles liées avec une composition liante durcie, où le drain ponctuel a un axe longitudinal qui est parallèle au côté le plus long du drain ponctuel, le positionnement du drain ponctuel dans le sol de sorte que l'axe longitudinal est dirigé vers le bas. 30
35
13. Procédé selon la revendication 11, dans lequel le trou est effectué à l'aide d'une foreuse. 40

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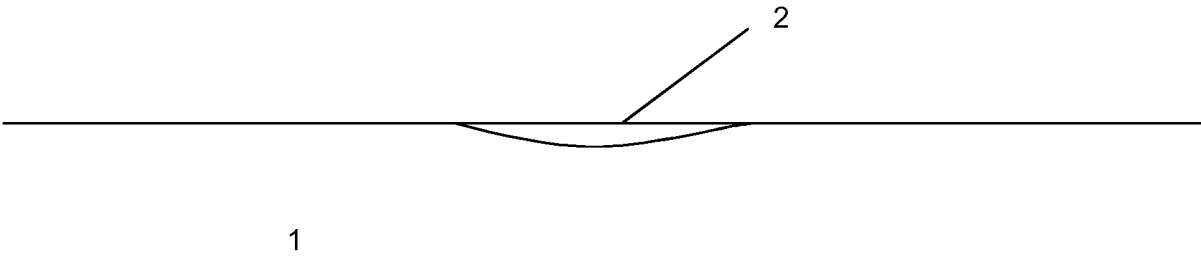


Figure 1

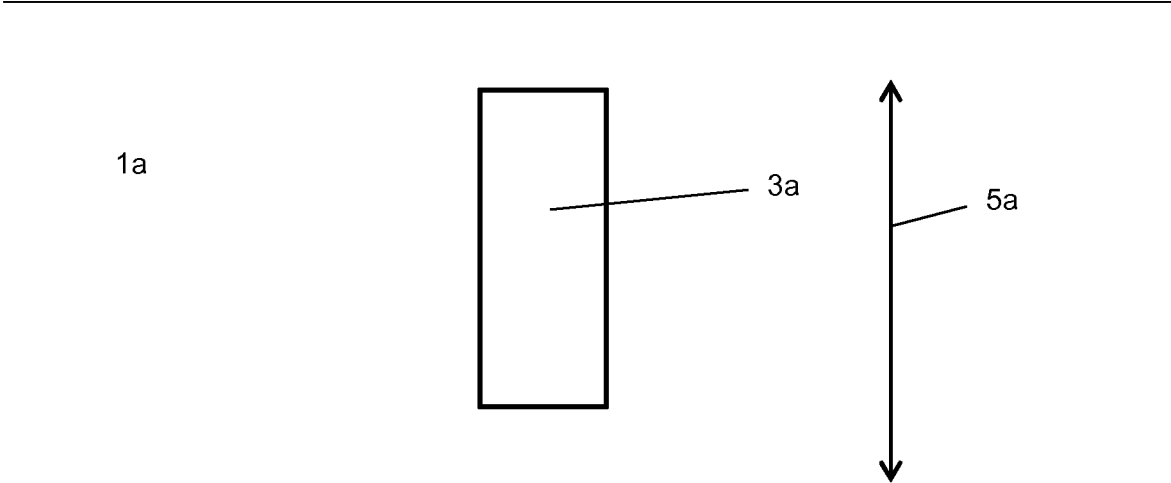


Figure 2

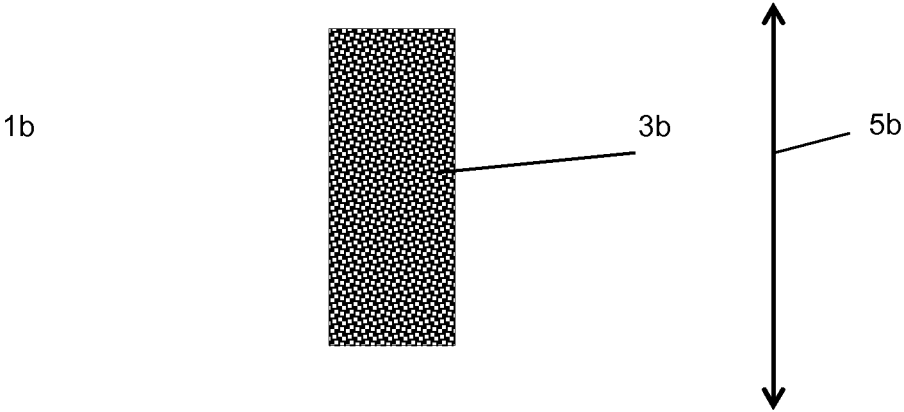


Figure 3

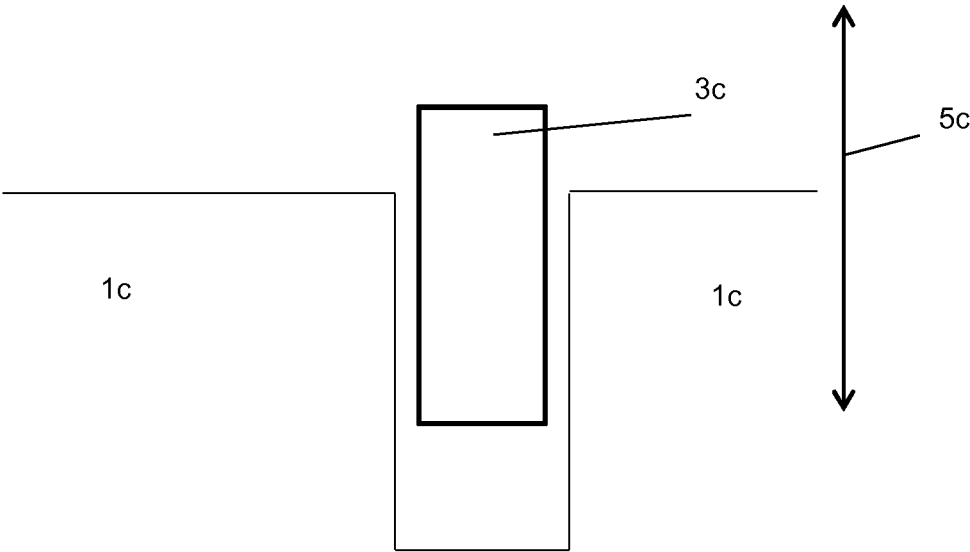


Figure 4

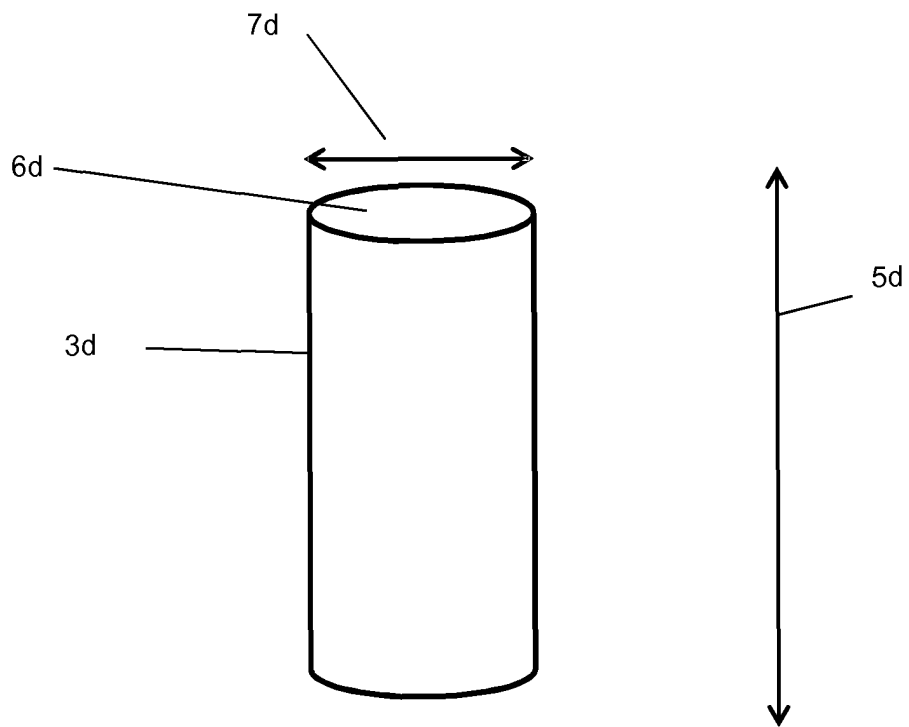


Figure 5

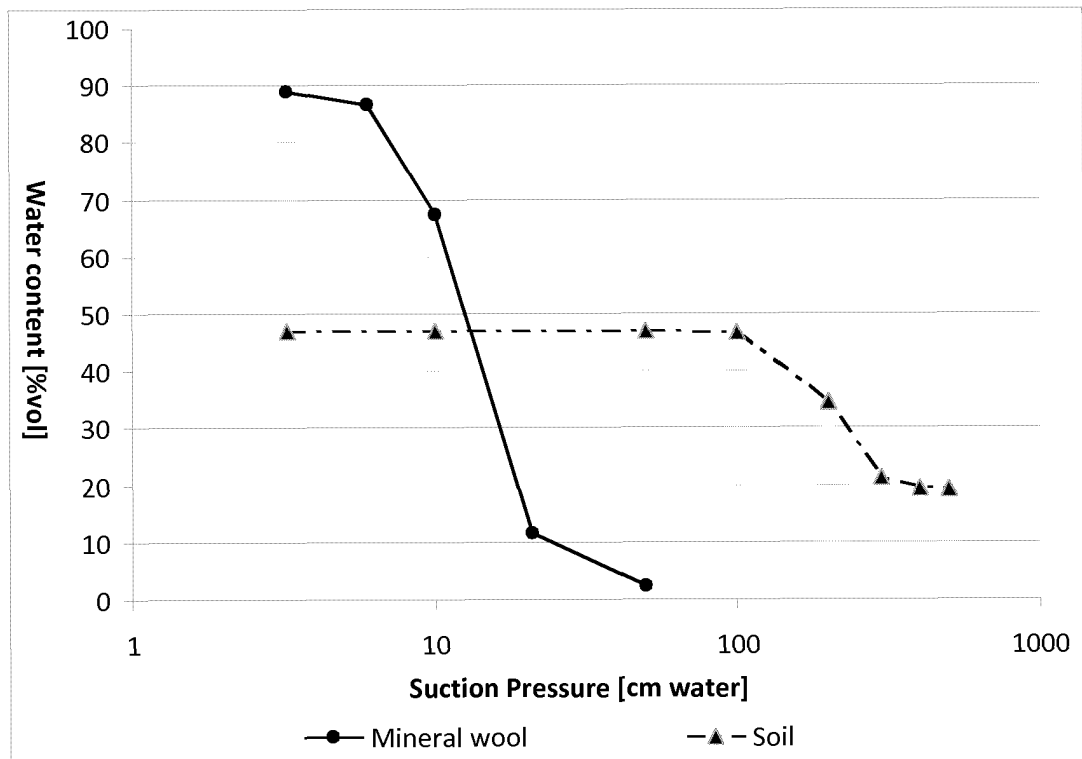


Figure 6

REFERENCES CITED IN THE DESCRIPTION

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