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Octrooi centrum
Nederland

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2012767

12 B1 OCTROOI

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Aanvraagnummer: **2012767**

51

Int. Cl.:
A01G 1/04 (2006.01) **C05F 17/02** (2006.01)

22

Aanvraag ingediend: **07/05/2014**

30

Voorrang:
08/05/2013 EP 13167036

73

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43

Aanvraag gepubliceerd:
19/11/2014

72

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47

Octrooi verleend:
18/07/2016

45

Octrooischrift uitgegeven:
07/11/2016

74

Gemachtigde:
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Pull mat.

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A pull mat for tunnel composting combining high tensile strength and high air permeability is provided comprising a layer of straight unidirectionally oriented threads and at least one open material layer. The pull mat according to the invention has a specific air permeability. In one embodiment the pull mat is used in mushroom cultivation.

Pull Mat

5 Description:

The invention pertains to a pull mat for tunnel composting.

Pull mats are used in tunnel composting where compostable material is being
10 composted while being placed on a pull mat. The pull mat is used to pull compost out of the composting tunnel.

Composting companies use composting tunnels wherein a substrate for mushroom culture can be produced, for example from a mixture of straw, horse manure, chicken
15 manure and gypsum. This composting process requires three consecutive phases wherein the processing conditions in each phase are controlled. The floor of the tunnel comprises a grid through which air can be blown into the compostable material.

After each of the composting phases the compost is pulled out of the composting tunnel
20 so that the compostable material may be mixed. The composting material may be humidified and/or spawn may be added to the compost. The pull mat is subsequently used to get the compostable material out of the composting tunnel.

The pull mat slides over so-called gliding mat which is attached to the grid in the floor of
25 the composting tunnel. The gliding mat is applied to lower the friction as compared to direct contact of the pull mat with the grid in the floor of the composting tunnel.

A pull mat has to combine high resistance against elongation and rupture to enable easy removal of compostable material from the tunnel with highest possible air
30 permeability to facilitate the composting process.

A pull mat preferably also minimizes friction in contact with the gliding mat.

US 7,501,360 B2, BE 1016731 A3 and NL 1026898 C all disclose a pull mat for tunnel composting comprising a fabric of warp and weft threads having at least one strip in longitudinal direction, which has higher tensile strength and lower stretch than the areas of the fabric adjacent to at least one the strip.

5

NL 1034567 C discloses a composting mat comprising a woven fabric of the ajour type wherein warp and weft threads are grouped together.

It is an object of the invention to provide a pull mat which has a high resistance against
10 elongation and rupture while having high air permeability.

The object of the invention is achieved by a pull mat according to claim 1.

A composite pull mat comprising a layer of straight, unidirectionally threads oriented in
15 the longitudinal direction of the pull mat in combination with an open material layer enables that the pull mat has high tensile strength and/or high modulus in combination with high air permeability.

A layer of straight, unidirectionally threads oriented in the longitudinal direction of the
20 pull mat is understood to consist of a multitude of straight individual threads which are placed essentially parallel to each other in a single plane. The layer of straight, unidirectionally threads explicitly does not comprise threads oriented in a direction different from the longitudinal direction in the same plane as the unidirectionally threads. The layer of straight, unidirectionally threads thus, for example, does not comprise weft
25 threads.

The thickness of the single plane comprising the straight, unidirectionally threads oriented in the longitudinal direction of the pull mat preferably essentially equals the thickness of the individual straight, unidirectionally threads. The ratio of the thickness of
30 the single plane comprising the straight, unidirectionally threads oriented in the longitudinal direction of the pull mat over the thickness of the individual straight, unidirectionally threads preferably is at most 1.50, more preferably at most 1.25, more preferably at most 1.10, even more preferably at most 1.05. Most preferably, the ratio of the thickness of the single plane comprising the straight, unidirectionally threads

oriented in the longitudinal direction of the pull mat over the thickness of the individual straight, unidirectionally threads is 1.00.

The term essentially parallel is understood to mean that the orientation of neighbouring individual threads differs by an angle of at most 5° , preferably by an angle of at most 2° , more preferably by an angle of at most 1° , even more preferably by an angle of at most 0.5° . Most preferably, the neighbouring individual threads are oriented exactly parallel to each other.

- 10 The unidirectionally oriented threads are preferably connected to the open material layer in order to ensure that the unidirectionally oriented threads remain spaced apart at the predetermined spacing and to ensure that the unidirectionally oriented threads remain straight so that a force applied to the pull mat in the longitudinal direction of the pull mat is directly carried by the unidirectionally oriented threads. The amount of stretch
15 of the pull mat is reduced, thereby reducing the amount of necking in of the pull mat upon removal of the compostable material from the composting tunnel.

The layer of straight unidirectionally oriented threads in the pull mat provides high tensile strength to the pull mat, which reduces the chance of rupture of the pull mat
20 upon removal of the compostable material from the composting tunnel. The layer of straight unidirectionally oriented threads thus acts as the load carrying layer of the pull mat. Known pull mats have a woven fabric which acts as the load carrying layer of the pull mat. However, such a woven fabric effectively acts as a barrier for the air which has to be blown through the compostable material.

- 25 The unidirectionally oriented threads may comprise monofilaments, multifilament yarns and/or tapes. Preferably, the unidirectionally oriented threads have a linear density of at least 1000 dtex, more preferably at least 5000 dtex, even more preferably at least 10000 dtex, most preferably at least 12500 dtex to provide high tensile strength and/or high modulus to the pull mat.

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The unidirectionally oriented threads may be any thread that has sufficiently high tensile strength and/or modulus to prevent rupture of the pull mat and/or minimizes the elongation of the pull mat due to forces applied to the pull mat upon removal of the compostable material from the composting tunnel.

Preferably, the pull mat comprises unidirectionally oriented threads having a modulus of at least 8 GPa.

The number of straight, unidirectionally oriented threads in the pull mat is preferably selected such that pull mat has a tensile strength of at least 300 kN/m, more preferably at least 350 kN/m, even more preferably at least 500 kN/m, most preferably at least 1000 kN/m.

The pull mat may comprise unidirectionally oriented threads spaced apart at a distance varying within a large range depending on the type of threads and the linear density of the threads, and the amount of compostable material placed on the pull mat. Preferably, the unidirectionally oriented threads spaced apart at a distance in the range of 0.25 mm to 250 mm, more preferably 1 mm to 100 mm, even more preferably 3 mm to 50 mm, even more preferably 5 mm to 20 mm, most preferably 10 to 15 mm.

In the first phase of the composting process a temperature of about 80°C is applied in the composting tunnel for a period of up to approx. 60 hours. In this phase the compostable material still has a relatively high density. At the end of the first phase the pull mat must still have sufficient strength to enable the large mass of compostable material to be pulled out of the composting tunnel. Therefore, the pull mat used in the first phase of the composting process preferably has a tensile strength of at least 1000 kN/m.

In the second and third phases of the composting process the density of the compostable material has been reduced, which has the consequence that the mass of compostable material present on the pull mat in the composting tunnel is less than in the first phase. Therefore, a pull mat used in the second and/or third phase of the composting process may have a tensile strength of at least 350 kN/m.

Although the unidirectionally oriented threads may be any thread that has sufficiently high tensile strength and/or modulus, the unidirectionally oriented threads are preferably made from a material which has high thermal and chemical resistance against the acidic

environment which may be present in the composting process. Preferably, the unidirectionally oriented threads are made from polyolefin.

The unidirectionally oriented threads may advantageously be made from polypropylene as polypropylene threads may provide sufficient tensile strength to the pull mat, in particular for the second and/or third phase of the composting process.

The unidirectionally oriented threads may advantageously be made from ultra high molecular weight polyethylene, in particular to provide sufficient tensile strength and/or modulus for the first phase of the composting process.

The at least one layer of open material serves the purpose of being a carrier material for the compostable material to prevent compostable material from falling through the grid in the floor of the composting tunnel. As the composting process is accelerated when air is blown through the compostable material, the pull mat has a high air permeability. Pull mats known in the art have air permeability of about 1500 l/m² sec at 100 Pa pressure difference (according ISO 9237-1995).

The at least one layer of open material in the pull mat according to the invention has an openness such that the pull mat has an air permeability of at least 1200 l/m² sec, preferably at least 2000 l/m² sec, preferably at least 2500 l/m² sec, more preferably at least 3000 l/m² sec, even more preferably at least 3500 l/m² sec, most preferably at least 4000 l/m² sec.

The at least one layer of open material may be a woven fabric, a laid scrim, a nonwoven fabric or a perforated film.

Preferably, the at least one layer of open material has an air permeability of at least 1200 l/m² sec, more preferably at least 2000 l/m² sec, more preferably at least 2500 l/m² sec, more preferably at least 3000 l/m² sec, even more preferably at least 3500 l/m² sec, most preferably at least 4000 l/m² sec when measured separately.

The term nonwoven fabric is understood to mean a sheet, continuous filaments, or chopped yarns of any nature or origin, that have been formed by any means into a web

of essentially randomly laid fibers, and bonded together by any means, with the exception of weaving or knitting and with the exception of paper.

The openness of the layer of open material is understood to be the total open area of the layer of open material divided by the total area of the layer of open material defined by the multiplication of the length and width of the layer. For example, when the layer of open material is a woven fabric, the total open area is the sum of the area of all openings formed between the warp and the weft threads. When the layer of open material is a perforated film, the total open area is the sum of the area of all perforations. When the layer of open material is a nonwoven fabric, the total open area is the sum of the area of all the pores formed between the fibers and/or filaments of the nonwoven fabric.

A woven fabric forming the at least one layer of open material may be of any construction which provides sufficient openness to allow the pull mat to have an air permeability of at least 2000 l/m² sec.

The individual openings in the woven fabric, the edges of the openings being formed by the warp and weft threads of the woven fabric, preferably have an area of at least 0.5 mm², more preferably at least 0.75 mm², most preferably at least 1 mm².

The woven may be for example of a plain weave construction or a leno construction to provide high stability to the open fabric. The woven may also be a twill to provide lower static friction with the gliding net or a satin to reduce friction when pulling the fabric and/or improve drapeability on the pulling cylinder. The woven may also comprise of a combination of these constructions to obtain the optimal combination of properties. These constructions may be combined in one woven layer or in separate layers which are held together with interconnecting threads.

A perforated film forming the at least one layer of open material may comprise perforations of any cross sectional shape, such as for example square, triangular, diamond shaped or round cross section. The perforations in the perforated film preferably have an area of at least 0.5 mm², more preferably at least 0.75 mm², most preferably at least 1 mm².

The perforated film may comprise perforations of different cross sectional area and/or of different cross sectional shape, such as for example square, triangular, diamond shaped and/or round cross section.

- 5 A laid scrim forming the at least one layer of open material may be a laid scrim of any known type provided that the openness is such that the air permeability of the pull mat is at least 2000 l/m² sec. The laid scrim may for example be a biaxial scrim, a triaxial scrim or a multiaxial scrim having more than three axis.
- 10 A nonwoven fabric forming the at least one layer of open material may nonwoven of any known type, for example a staple fiber nonwoven, such as a carded nonwoven or an airlaid nonwoven, or a filamentary nonwoven provided that the openness is such that the air permeability of the pull mat is at least 2000 l/m² sec.
The pull mat may comprise a further layer of open material of any type discussed
15 above. Preferably, the at least one layer of open material and the further layer of open material are being positioned on opposite sides of the layer of straight unidirectionally oriented threads.

The layer of open material facing the floor of the composting tunnel can be selected
20 such to minimize the friction between the pull mat and the sliding mat connected to the grid in the floor of the composting tunnel. The straight unidirectionally oriented threads are not in direct contact with the sliding mat, which reduces the chance of damage to the straight unidirectionally oriented threads by abrasion, which improves the durability of the pull mat.

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By minimizing the friction between the pull mat and the sliding mat, the tensile forces applied to the pull mat upon removal of the compostable material from the composting tunnel will be reduced which enables the use of straight unidirectionally oriented threads having lower tensile strength and/or lower modulus, and/or the reduction of the number
30 of straight unidirectionally oriented threads per meter width of the pull mat.

The layer of open material facing the gliding mat can be selected to have a flat surface, i.e. not an undulating surface as with woven fabrics forming known pull mats. Nonwoven fabrics, laid scrims and perforated films can be manufactured to have a flat surface.

The layer of open material facing the compostable material can be selected such that compostable material will not fall through the pull mat into the grid in the floor of the composting tunnel, while shielding the straight unidirectionally oriented threads from direct contact with the compostable material, which is advantageous for improving the durability of the pull mat.

The connection of the straight unidirectionally oriented threads to the at least one layer of open material and/or to the further layer of open material may be achieved in different ways.

The connection of the straight unidirectionally oriented threads to the at least one layer of open material and/or to the further layer of open material may be achieved by applying an adhesive between the straight unidirectionally oriented threads and the at least one layer of open material and/or the further layer of open material.

The connection of the straight unidirectionally oriented threads to the at least one layer of open material and/or to the further layer of open material may also be achieved by a polymeric binder. The polymeric binder may originate from the layer of open material to be connected to the straight unidirectionally oriented threads, for example from bicomponent staple fibers or bicomponent filaments when the layer of open material is a nonwoven fabric. When the layer of open material is a woven fabric, the polymeric binder may be present in bicomponent warp and/or weft threads or the woven fabric may comprise warp and/or weft threads which acts a binder threads. For example the woven fabric may comprise two types of weft threads, for example in alternating configuration, wherein one of the types of weft threads acts as binder threads. When the layer of open material is a perforated film, the film may be co-extruded film, wherein the surface facing the straight unidirectionally oriented threads provides the polymeric binder.

Alternatively a thin film of polymeric binder may be separately introduced between the layer of open material and the straight unidirectionally oriented threads.

The connection of the straight unidirectionally oriented threads to the at least one layer of open material and/or to the further layer of open material may also be achieved by one or more stitching threads.

Each stitching thread may be a separate thread added by a known type of stitching machine.

- 5 The stitching thread may also originate from the layer of open material to which the straight unidirectionally oriented threads are to be connected, when the layer of open material is a woven fabric. A warp and/or a weft thread of the woven fabric may at predetermined intervals encapsulate a straight unidirectionally oriented thread to connect the unidirectionally oriented thread to the woven fabric. The orientation of such a warp and/or a weft thread of the woven fabric encapsulating the straight
- 10 unidirectionally oriented thread is under an certain angle to the plane of the layer of straight unidirectionally threads oriented in the longitudinal direction of the pull mat, wherein the actual angle is determined by the amount of warp and/or weft threads of the woven fabric to which the straight unidirectionally oriented threads are to be connected and the binding pattern. Preferably, the angle between such a warp and/or a weft thread
- 15 of the woven fabric encapsulating the straight unidirectionally oriented thread and the plane in which the straight unidirectionally oriented threads are comprised is at least 10° , more preferably at least 20° , even more preferably at least 30° , most preferably at least 45° .
- 20 When the straight unidirectionally oriented threads are to be connected to the at least one layer of open material and to the further layer of open material, being positioned on opposite sides of the layer of straight unidirectionally oriented threads, a warp and/or a weft thread of the woven fabric forming the at least one open layer may encapsulate a straight unidirectionally oriented thread and continue to be part of the woven fabric
- 25 forming the further open layer, thus creating an interconnecting woven structure sandwiching the layer of straight unidirectionally threads. The layer of straight unidirectionally threads oriented in the longitudinal direction of the pull mat is thereby connected to the at least one layer of open material and to the further layer of open material without any other threads being comprised and/or oriented at a direction
- 30 different from the longitudinal direction in the same plane as the layer of unidirectionally threads oriented in the longitudinal direction. In this embodiment, the pull mat may be considered to be a double weave comprising the straight unidirectionally threads oriented in the longitudinal direction as filling warp threads, wherein the straight

unidirectionally threads are embedded between two layers of interwoven woven fabrics without the embedded straight unidirectionally threads contributing to the cohesion of the double weave woven fabric.

- 5 A woven fabric forming the at least one layer of open material may also be woven in such a way that at the location where a straight unidirectionally oriented thread is to be connected to the layer of open material, the woven fabric forms two separated woven layers, each woven layer of the woven fabric being positioned on opposite sides of the straight unidirectionally oriented thread. The woven fabric thus comprises alternating
10 sections of a single woven layer and sections of two woven layers.

The at least one layer of open material and/or the further layer of open material may also be formed by one or two knitted fabrics.

- 15 Known pull mats having a woven fabric as load carrying layer are generally manufactured on a shuttle weaving machine to ensure that the selvages of the woven fabric are sufficiently strong and do not fray. On a shuttle weaving machine a single weft thread is inserted from one side of the fabric the other side and back again, thereby forming loops at the selvages of the woven fabric. This type of weaving process is slow
20 and expensive.

The pull mat according to the invention does not need to be manufactured on a shuttle weaving machine, but may for example be manufactured on projectile or rapier weaving machines, which enables to reduce production costs of the pull mat.

25

Examples

Example 1

- A pull mat was manufactured comprising a layer of straight, unidirectionally oriented
30 threads made of ultra high molecular weight polyethylene, spaced apart from each other at a distance of 1.33 cm. The threads of were multifilament Dyneema yarns of 1876 dtex.

On both sides of this layer of unidirectionally oriented threads a woven fabric, type Bontec HF1300 of Bonar Technical Fabrics, having a weight of 95 g/m² was stitched. The woven fabric comprised openings of about 1 mm².

- 5 The average air permeability of the pull mat was 3980 l/m² sec as determined according to ISO 9237-1995 at a pressure difference of 100 Pa with a gauge surface of 20 cm² using a Textest FX 3300 testing apparatus. The average air permeability has been calculated from 10 individual measurements.

10 Example 2

A pull mat was manufactured comprising a layer of straight, unidirectionally oriented threads made of ultra high molecular weight polyethylene, spaced apart from each other at a distance of 1.50 cm. The threads of were multifilament Dyneema yarns of 1408 tex.

15

On both sides of this layer of unidirectionally oriented threads a plain weave woven fabric, comprising polyethylene monofilaments of 115 tex having a width of 0.39 mm both as warp and weft threads, wherein the woven fabric comprises 5 warp threads per cm and 8 weft threads per cm.

- 20 The pull mat is an interconnected woven structure sandwiching the layer of straight unidirectionally threads, wherein the number of threads from the first woven fabric encapsulating the straight unidirectionally oriented threads and continue to be part of the woven fabric forming the further open layer, is 5.33 per cm².
- 25 The average air permeability of the pull mat was 4127 l/m² sec as determined according to ISO 9237-1995 at a pressure difference of 100 Pa with a gauge surface of 20 cm² using a Textest FX 3300 testing apparatus. The average air permeability has been calculated from 5 individual measurements.

30 Example 3

A pull mat was manufactured comprising a layer of straight, unidirectionally oriented threads made of ultra high molecular weight polyethylene, spaced apart from each other at a distance of 0.50 cm. The threads of were multifilament Dyneema yarns of 1408 tex.

On both sides of this layer of unidirectionally oriented threads a plain weave woven fabric, comprising polyethylene monofilaments of 115 tex having a width of 0.39 mm both as warp and weft threads, wherein the woven fabric comprises 5 warp threads per cm and 8 weft threads per cm.

5

The pull mat is an interconnected woven structure sandwiching the layer of straight unidirectionally threads, wherein the number of threads from the first woven fabric encapsulating the straight unidirectionally oriented threads and continue to be part of the woven fabric forming the further open layer, is 16 per cm².

10

The average air permeability of the pull mat was 1204 l/m² sec as determined according to ISO 9237-1995 at a pressure difference of 100 Pa with a gauge surface of 20 cm² using a Textest FX 3300 testing apparatus. The average air permeability has been calculated from 5 individual measurements.

15

Example 4

A pull mat was manufactured comprising a layer of straight, unidirectionally oriented threads made of ultra high molecular weight polyethylene, spaced apart from each other at a distance of 1.50 cm. The threads of were multifilament Dyneema yarns of 1408 tex.

20

On both sides of this layer of unidirectionally oriented threads a plain weave woven fabric, comprising polyethylene monofilaments of 115 tex having a width of 0.39 mm both as warp and weft threads, wherein the woven fabric comprises 5 warp threads per cm and 8 weft threads per cm.

25

The pull mat is an interconnected woven structure sandwiching the layer of straight unidirectionally threads, wherein the number of threads from the first woven fabric encapsulating the straight unidirectionally oriented threads and continue to be part of the woven fabric forming the further open layer, is 0.26 per cm².

30

The average air permeability of the pull mat was 4596 l/m² sec as determined according to ISO 9237-1995 at a pressure difference of 100 Pa with a gauge surface of 20 cm²

using a Textest FX 3300 testing apparatus. The average air permeability has been calculated from 5 individual measurements.

Example 5

5

A pull mat was manufactured comprising a layer of straight, unidirectionally oriented threads made of ultra high molecular weight polyethylene, spaced apart from each other at a distance of 0.50 cm. The threads of were multifilament Dyneema yarns of 1408 tex.

- 10 On both sides of this layer of unidirectionally oriented threads a plain weave woven fabric, comprising polyethylene monofilaments of 115 tex having a width of 0.39 mm both as warp and weft threads, wherein the woven fabric comprises 5 warp threads per cm and 8 weft threads per cm.
- 15 The pull mat is an interconnected woven structure sandwiching the layer of straight unidirectionally threads, wherein the number of threads from the first woven fabric encapsulating the straight unidirectionally oriented threads and continue to be part of the woven fabric forming the further open layer, is 0.78 per cm².
- 20 The average air permeability of the pull mat was 2152 l/m² sec as determined according to ISO 9237-1995 at a pressure difference of 100 Pa with a gauge surface of 20 cm² using a Textest FX 3300 testing apparatus. The average air permeability has been calculated from 5 individual measurements.

25

Pull Mat

What is claimed is:

- 5 1. A pull mat for tunnel composting comprising a layer of straight unidirectionally threads oriented in the longitudinal direction of the pull mat, the layer consisting of a multitude of straight individual threads which are placed essentially parallel to each other in a single plane, the straight unidirectionally threads being spaced apart from each other, preferably at regular distances, and at least one layer of open material, the at least one layer of open material being a woven
10 fabric, a laid scrim, a nonwoven fabric or a perforated film, wherein the pull mat has an air permeability of at least 1200 l-m² sec, preferably at least 2000 l/m² sec, more preferably at least 3000 l/m² sec, as determined according to ISO 9237-1995 at a pressure difference of 100 Pa.
- 15 2. The pull mat according to claim 1 wherein the unidirectionally threads comprise monofilaments, multifilament yarns and/or tapes.
3. The pull mat according to any of the preceding claims wherein the unidirectionally threads have a modulus of 8 GPa or higher.
20 4. The pull mat according to any of the preceding claims wherein the unidirectionally threads are made from a polyolefin.
5. The pull mat according to claim 4 wherein the unidirectionally threads are
25 made from polypropylene.
6. The pull mat according to claim 4 wherein the unidirectionally threads are made from ultra high molecular weight polyethylene.
- 30 7. The pull mat according to any of the preceding claims wherein the pull mat comprises a further layer of open material, the at least one layer of open material and the further layer of open material being positioned on opposite sides of the layer of straight, unidirectionally threads.

8. The pull mat according to any of the preceding claims wherein the straight unidirectionally threads are connected to the at least one layer of open material and/or to the further layer of open material.

5 9. The pull mat according to claim 8 wherein the straight unidirectionally threads are connected to the at least one layer of open material and/or the further layer of open material by an adhesive applied between the straight unidirectionally threads and the at least one layer of open material and/or the further layer of open material.

10 10. The pull mat according to claim 10 wherein the straight unidirectionally threads are connected to the at least one layer of open material and/or the further layer of open material by a polymeric binder.

15 11. The pull mat according to claim 10 wherein the straight unidirectionally threads are connected to the at least one layer of open material and/or the further layer of open material by one or more stitching threads.

20 12. The pull mat according to claim 11 wherein the stitching thread originates from a woven fabric forming the at least one layer of open material and/or the further layer of open material.

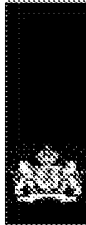
13. Use of the pull mat according to any of claims 1 to 12 in tunnel composting.

25 14. Use of the pull mat according to any of claims 1 to 12 in mushroom cultivation.

Summary of the invention:

A pull mat for tunnel composting combining high tensile strength and high air permeability is provided comprising a layer of straight unidirectionally oriented threads
5 and at least one open material layer.

The pull mat according to the invention has a specific air permeability. In one embodiment the pull mat is used in mushroom cultivation.



Rijksdienst voor Ondernemend
Nederland

OCTROOIAANVRAAG NR.
NO 139073
NL 2012767

ONDERZOEKSRAPPORT

BETREFFENDE HET RESULTAAT VAN HET ONDERZOEK NAAR DE STAND VAN DE TECHNIEK

RELEVANTE LITERATUUR			
Categorie	Literatuur met, voor zover nodig, aanduiding van specifiek van belang zijnde tekstgedeelten of figuren	Van belang voor (conclusie) nr.	Classificatie (IPC)
A,D	US 7 501 360 B2 (HEEZEN JAN-WILLEM [NL] ET AL) 10 maart 2009 (2009-03-10) * conclusies *	1-14	INV. C05F17/02 A01G1/04
A,D	NL 1 034 567 C2 (TEN CATE GEOSYNTHETICS NETHERLANDS [NL]) 18 januari 2010 (2010-01-18) * conclusies *	1-14	
A	ANONYMOUS: "Tunnel- en glijmatten", INTERNET CITATION, 2009, bladzijden 1-2, XPO02550916, Gevonden op het Internet: URL: http://www.mertens-mushrooms.com/download/447-ChampignonLeafletTunnelmatten.pdf [gevonden op 2009-01-01] * het gehele document *	1-14	
A	WO 2010/026227 A1 (BONAR TECHNICAL FABRICS N V [BE]; SWENNEN IVES JEAN JENNY GHISLA [BE];) 11 maart 2010 (2010-03-11) * bladzijde 9 - bladzijde 11; conclusies; figuren *	1-14	Onderzochte gebieden van de techniek C05F A01G D03D
Indien gewijzigde conclusies zijn ingediend, heeft dit rapport betrekking op de conclusies ingediend op:			
Plaats van onderzoek:		Datum waarop het onderzoek werd voltooid:	Bevoegd ambtenaar
's-Gravenhage		10 februari 2016	Merckx, Alain
CATEGORIE VAN DE VERMELDE LITERATUUR			
X: de conclusie wordt als niet nieuw of niet inventief beschouwd ten opzichte van deze literatuur Y: de conclusie wordt als niet inventief beschouwd ten opzichte van de combinatie van deze literatuur met andere geopenbaarde literatuur van dezelfde categorie, waarbij de combinatie voor de vakman voor de hand liggend wordt geacht A: niet tot de categorie X of Y behorende literatuur die de stand van de techniek beschrijft C: niet-schriftelijke stand van de techniek P: tussen de voormengedatum en de indieningsdatum gepubliceerde literatuur T: na de indieningsdatum of de voormengedatum gepubliceerde literatuur die niet bezwaarlijk is voor de octrooiaanvraag, maar wordt vermeld ter verheldering van de theorie of het principe dat ten grondslag ligt aan de uitvinding E: eerdere octrooiaanvragen, gepubliceerd op of na de indieningsdatum, waarin dezelfde uitvinding wordt beschreven D: in de octrooiaanvraag vermeld L: om andere redenen vermelde literatuur N: na van dezelfde octrooiaanvraag of overeenkomstige octrooiaanvraag			

**AANHANGSEL BEHORENDE BIJ HET RAPPORT BETREFFENDE
HET ONDERZOEK NAAR DE STAND VAN DE TECHNIEK,
UITGEVOERD IN DE OCTROOIAANVRAGE NR.**

NO 139073
NL 2012767

Het aanhangsel bevat een opgave van elders gepubliceerde octrooiaanvragen of octrooien (zogenaamde leden van dezelfde octroofamilie), die overeenkomen met octrooschriften genoemd in het rapport.

De opgave is samengesteld aan de hand van gegevens uit het computerbestand van het Europees Octrooibureau per

De juistheid en volledigheid van deze opgave wordt noch door het Europees Octrooibureau, noch door het Bureau voor de Industriële eigendom gegarandeerd; de gegevens worden verstrekt voor informatiedoeleinden.

10-02-2016

In het rapport genoemd octrooigeschrift		Datum van publicatie	Overeenkomend(e) geschrift(en)	Datum van publicatie
US 7501360	B2	10-03-2009	GEEN	
NL 1034567	C2	18-01-2010	NL 1034567 A1	23-04-2009
			NL 1034567 C2	18-01-2010
WO 2010026227	A1	11-03-2010	AT 532891 T	15-11-2011
			AU 2009289253 A1	11-03-2010
			DK 2329070 T3	16-01-2012
			EP 2329070 A1	08-06-2011
			ES 2375916 T3	07-03-2012
			US 2011197508 A1	18-08-2011
			WO 2010026227 A1	11-03-2010

SCHRIFTELIJKE OPINIE

DOSSIER NUMMER NO139073	INDIENINGSDATUM 07.05.2014	VOORRANGSDATUM 08.05.2013	AANVRAAGNUMMER NL2012767
CLASSIFICATIE INV. C05F17/02 A01G1/04			
AANVRAGER Bonar B.V.			

Deze schriftelijke opinie bevat een toelichting op de volgende onderdelen:

- ☒ Onderdeel I Basis van de schriftelijke opinie
- ☐ Onderdeel II Voorrang
- ☐ Onderdeel III Vaststelling nieuwheid, inventiviteit en industriële toepasbaarheid niet mogelijk
- ☐ Onderdeel IV De aanvraag heeft betrekking op meer dan één uitvinding
- ☒ Onderdeel V Gemotiveerde verklaring ten aanzien van nieuwheid, inventiviteit en industriële toepasbaarheid
- ☐ Onderdeel VI Andere geciteerde documenten
- ☐ Onderdeel VII Overige gebreken
- ☐ Onderdeel VIII Overige opmerkingen

	DE BEVOEGDE AMBTENAAR Merckx, Alain
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SCHRIFTELIJKE OPINIE

Aanvraag nr.
NL2012767

Onderdeel I Basis van de Schriftelijke Opinie

1. Deze schriftelijke opinie is opgesteld op basis van de meest recente conclusies ingediend voor aanvang van het onderzoek.
2. Met betrekking tot **nucleotide en/of aminozuur sequenties** die genoemd worden in de aanvraag en relevant zijn voor de uitvinding zoals beschreven in de conclusies, is dit onderzoek gedaan op basis van:
 - a. type materiaal:
 - ☐ sequentie opsomming
 - ☐ tabel met betrekking tot de sequentie lijst
 - b. vorm van het materiaal:
 - ☐ op papier
 - ☐ in elektronische vorm
 - c. moment van indiening/aanlevering:
 - ☐ opgenomen in de aanvraag zoals ingediend
 - ☐ samen met de aanvraag elektronisch ingediend
 - ☐ later aangeleverd voor het onderzoek
3. ☐ In geval er meer dan één versie of kopie van een sequentie opsomming of tabel met betrekking op een sequentie is ingediend of aangeleverd, zijn de benodigde verklaringen ingediend dat de informatie in de latere of additionele kopieën identiek is aan de aanvraag zoals ingediend of niet meer informatie bevatten dan de aanvraag zoals oorspronkelijk werd ingediend.
4. Overige opmerkingen:

SCHRIFTELIJKE OPINIE

Aanvraag nr.
NL2012767

Onderdeel V Gemotiveerde verklaring ten aanzien van nieuwheid, inventiviteit en industriële toepasbaarheid

1. Verklaring

Nieuwheid	Ja: Conclusies 1-14
	Nee: Conclusies
Inventiviteit	Ja: Conclusies 1-14
	Nee: Conclusies
Industriële toepasbaarheid	Ja: Conclusies 1-14
	Nee: Conclusies

2. Citaties en toelichting:

Zie aparte bladzijde

Re Item V

Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1 Reference is made to the following document:

D1: US 7 501 360 B2 (HEEZEN JAN-WILLEM [NL] ET AL), 10 March 2009

2 All claims comply with the requirements of novelty and inventive step

The subject matter of the claims 1 to 14 is considered to be novel and to involve an inventive step.

2.1 The document D1 is regarded as being the prior art closest to the subject matter of independent claim 1, and discloses (references apply to D1):

A pull mat for tunnel composting, comprising a fabric of warp and weft threads.

2.2 Hence, the subject matter of claim 1 differs from this known pull mat in that:

De trekmat omvat een laag rechte unidirectionele draden geïntendeerd in de langsrichting van de trekmat, waarbij de laag bestaat uit een veelheid van rechte unidirectionele draden welke in essentie parallel ten opzichte van elkaar in een enkele laag geplaatst zijn, waarbij de rechte unidirectionele draden verspreid zijn ten opzichte van elkaar, bij voorkeur op regelmatige afstand, en ten minste één laag open materiaal, de tenminste één laag open materiaal zijnde een weefsel, een gaas, een niet-geweven materiaal of een geperforeerde folie, waarbij de trekmat een luchtdoorlaatbaarheid heeft van ten minste 1200 l/m² sec, bij voorkeur tenminste 2000 l/m² sec, bij voorkeur tenminste 3000 l/m² sec, bepaald in overeenstemming met ISO 9237-1995 bij een drukverschil van 100 Pa.

2.3 The subject matter of claim 1 is therefore new.

The problem to be solved by the present invention may be regarded as:

To provide a pull mat which has a high resistance against elongation and rupture, while having high air permeability (see description, page 2, lines 9-10).

2.4 The solution to this problem proposed in claim 1 of the present application is considered as involving an inventive step for the following reasons:

None of the prior art documents, cited in the search report, either taken individually or in combination, disclose, suggest or reasonably lead the person skilled in the art to consider a pull mat having all the features of claim 1.

The pull mat of claim 1 contains a layer of unidirectionally oriented threads and a layer of open material, although the pull mat of D1 contains only a layer of fabric, i.e. of perpendicularly woven warp and weft threads.

- 2.5 Claims 2 to 12 are dependent on claim 1 and claims 13 and 14 relate to the use of such a pull mat, therefore claims 2 to 14 also meet the requirements of novelty and inventive step.



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INTEROFFICE MEMO

Application No

NO 139073

NL 2012767

This file is a full doublure of SA1275920, searched in August 2014 by A. Cardin. No further search has been made. However, in view of the cited documents and the arguments of the applicant in his letter dated 04-02-2015, the outcome of this search report and written opinion has been reviewed and is now positive.



REQUEST FOR FEEDBACK

Examiner

Merckx, Alain

1655-S2947

Date

10 februari 2016