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(54) Title: ARTIFICIAL GRASS BUILT UP OF FIBRES THAT CONSIST OF A CORE AND A CLADDING, AS WELL AS AN ARTIFICIAL LAWN BUILT UP THEREFROM

(57) Abstract: The invention relates to a drain for liquid comprising a detachable pipe part provided with a stench-trap, placed substantially horizontal in or in connection to a drainage pipe, wherein the pipe part comprises positioning means for placing the pipe part in or in connection to the drainage pipe with a substantially univocal orientation. In one embodiment the drain comprises a receptacle having a bottom wall and raised side walls, wherein the raised side walls comprise a first side wall provided with a drainage opening placed therein, wherein the drainage pipe is placed at an outside of the receptacle so as to connect to the drainage opening. The drain according to the invention is particularly suitable for placement in for instance a finishing floor of a wet area in a building, such as for instance a bathroom or a shower cubicle.

Artificial grass built up of fibres that consist of a core and a cladding, as well as an artificial lawn built up therefrom.

The present invention relates to an artificial grass built up of fibres that consist of a core and a cladding, which core and which cladding are composed of a plastic material.

Such a type of artificial grass is known per se from European patent EP 0 996 781 granted to the present applicant, which evolved out of WO 99/04074, in which a polyamide-containing yarn is used for fabricating artificial grass, wherein the yarn, besides polyamide, also contains a polyolefin compound selected from the group consisting of polypropylene, LLDPE and a block copolymer of polypropylene and polyethylene. In addition to the method of manufacturing a yarn that is known therefrom, wherein the polymer is extruded so as to form monofilaments, which are subsequently processed into bands, with several bands being twisted to form a yarn, a method is disclosed in which the yarn is obtained by means of a co-extrusion process. When such an extrusion process is used, the cladding consists of polyamide, whilst the core consists of one of the aforesaid plastics.

From International application WO 2004/106601 there is known a yarn for an artificial lawn in which the yarn is a so-called tape filament consisting of a core layer and two outer layers of a material different from that of the core layer, wherein the core layer contains polyester and/or polyolefin material and wherein the outer layers contain high-density polyethylene.

Japanese patent publication JP 2003 342848 discloses a yarn for an artificial lawn that consists of a conjugated yarn formed of a resin composition comprising 70-99 wt.% nylon (polyamide) and 1-30 wt.% polyethylene as the inner layer and polyethylene as the outer layer.

A well-known phenomenon with artificial grass, in particular if the artificial grass is used for playing soccer thereon, is the occurrence of burns when players make a sliding tackle. This problem does not occur with natural grass, which natural material has a high a water content and which feels soft upon contact, so that the friction with the skin will be high. This high friction is disadvantageous from the viewpoint of skin damage, but because of the fact that the natural grass will wear away slightly upon contact, burns do not occur upon contact with natural grass. In addition to that it can be noted that natural grass is soft and will grow again after

having worn away, in which connection it can furthermore be noted that the relatively soft nature of natural grass also contributes to favourable resilient properties.

On the other hand, there is generally a controversy when selecting the materials to be used for artificial grass. The material used for the artificial grass is a soft material, for example, which has a large elastic range. Such a property makes for a good resilience, but also a high degree of friction, which latter aspect will lead to excessive adhesion of the skin to the artificial grass when a sliding tackle is made, and thus to inevitable damage to the skin, which is undesirable. Said materials are evaluated as unsatisfactory as regards the heat development that takes place when a sliding tackle is made, in spite of the fact that because of the high degree of friction the period of contact between the skin and the artificial grass remains limited. The material used for the artificial grass may also be a hard material having a small elastic range, which leads to unsatisfactory properties as regards resilience but also to less friction. The reduction as regards the degree of friction will lead to less skin damage. In addition to that, said hard materials are evaluated as satisfactory as regards the heat development during sliding tackles, because the period of contact is longer.

It is an object of the present invention to provide a special type of artificial grass which imitates the advantageous properties of natural grass, in particular as regards resilience and behaviour during sliding tackles, as much as possible.

Another object of the present invention is to provide an artificial grass which exhibits a high degree of durability and which can be composed of commercially available materials.

According to the present invention, the artificial grass as referred to in the introduction is characterized in that the material for the core has been selected from the group consisting of polypropylene, ethyl vinyl acetate (EVA), saturated styrene thermoplastic elastomer (SEBS), polyamide and polyethylene compounds, or combinations thereof.

One or more of the above objects are achieved by using such a type of artificial grass. Because a soft material is used for the core, favourable properties as regards resilience can be obtained, without the aforesaid disadvantageous surface properties playing a part. Moreover, because the cladding is built up of a relatively hard material, use is advantageously made of the relatively favourable

surface properties, viz. a low degree of skin damage as a result of the low adhesion to the skin. Moreover, the unfavourable properties as regards resilience are minimised by using a hard material for the cladding.

The terms "soft" and "hard" as used in the present description must be interpreted in relation to each other, in which connection it is in particular important that the material for the cladding is harder than the material that is used for the core. The soft material for the core will have an elasticity modulus (according to ASTM D638) of maximally 500 MPa, preferably maximally 300 MPa. The hard material for the cladding will have an elasticity modulus (according to ASTM D638) of minimally 500 MPa, preferably minimally 750 MPa.

In a special embodiment, the material for the cladding has preferably been selected from the group consisting of polyethylene compounds, polypropylene and fluor polymers or combinations thereof, wherein the polyethylene compounds have been selected from the group consisting of high density polyethylene (HDPE), medium density polyethylene (MDPE), low density polyethylene (LDPE), linear low-density polyethylene (LLDPE) and anhydride modified polyethylene compounds.

In a special embodiment of the present invention, the cladding of the artificial fibre is relatively thin, viz. the thickness of the cladding is such that its volume makes up 1-40%, preferably 1-20%, of the volume of the entire fibre. Such a small thickness for the cladding makes it possible to make advantageous use of the high specific heat properties of the core material, which will lead to a reduced occurrence of burns.

The artificial grass according to the present invention is further characterized in that the artificial grass fibre has been obtained by means of a co-extrusion process, wherein the material for the core and the material for the cladding are extruded simultaneously, with the cladding being in direct contact with the core.

According to a preferred embodiment of the present artificial grass, the material for the core is polyamide and the material for the cladding is an anhydride modified HDPE.

According to yet another special embodiment of the present artificial grass, the material for the core is LDPE and the material for the cladding is HDPE. In a special embodiment, the material for the core is moreover preferably a combination of polypropylene and SEBS and the material for the cladding is

polypropylene. Other preferred embodiments of the present artificial grass are characterized in that the material for the core is EVA and the material for the cladding is a fluor polymer, wherein the material for the core also contains polypropylene and/or polyethylene besides EVA and wherein polyvinylidene fluoride (PVDF) is used as the fluor polymer.

The present invention furthermore relates to an artificial lawn built up from an artificial grass as described above.

In a special embodiment, a mixture of, for example, polyamide, in particular polyamide 12, and a modified polyethylene can be used for the core. Another suitable material for the core is a combination of LDPE and HDPE.

To prevent delamination of the core and the cladding, a compatibility agent has preferably been added to the material for the core and/or to the material for the cladding, or to both materials, which compatibility agent enhances the bond between the material for the core and the material for the cladding. A suitable compatibility agent is a copolymer of ethylene and methyl acrylate, with the methyl acrylate content in particular amounting to less than 50%, preferably about 30%.

CLAIMS

1. An artificial grass built up of fibres that consist of a core and a cladding, which core and which cladding are composed of a plastic material, characterized in that the material for the core has been selected from the group consisting of polypropylene, ethyl vinyl acetate (EVA), saturated styrene thermoplastic elastomer (SEBS), polyamide and polyethylene compounds, or combinations thereof.

2. An artificial grass according to claim 1, characterized in that the material for the cladding has been selected from the group consisting of polyethylene compounds, polypropylene and fluor polymers, or combinations thereof.

3. An artificial grass according to either one or both of the preceding claims, characterized in that the polyethylene compounds have been selected from the group consisting of high density polyethylene (HDPE), medium density polyethylene (MDPE), low density polyethylene (LDPE), linear low-density polyethylene (LLDPE) and anhydride modified polyethylene compounds.

4. An artificial grass according to any one or more of the preceding claims, characterized in that the artificial glass fibre has been obtained by means of a co-extrusion process, wherein the material for the core and the material for the cladding are extruded simultaneously, with the cladding being in direct contact with the core.

5. An artificial grass according to any one or more of the claims 1-4, characterized in that the material for the core is polyamide and the material for the cladding is an anhydride modified HDPE.

6. An artificial grass according to any one or more of the claims 1-4, characterized in that the material for the core is LDPE and the material for the cladding is HDPE.

7. An artificial grass according to any one or more of the claims 1-4, characterized in that the material for the core is a combination of polypropylene and SEBS and the material for the cladding is polypropylene.

8. An artificial grass according to any one or more of the claims 1-4, characterized in that the material for the core is EVA and the material for the cladding is a fluor polymer.

9. An artificial grass according to claim 8, characterized in that the material for the core also contains polypropylene and/or polyethylene besides EVA.

10. An artificial grass according to claim 8, characterized in that polyvinylidene fluoride (PVDF) is used as the fluor polymer.

11. An artificial grass according to any one or more of the preceding claims, characterized in that the material for the core has an elasticity modulus (measured in accordance with ASTM D638) of maximally 500 MPa.

12. An artificial grass according to claim 11, characterized in that the material for the core has an elasticity modulus (measured in accordance with ASTM D638) of maximally 300 MPa.

13. An artificial grass according to any one or more of the preceding claims, characterized in that the material for the cladding has an elasticity modulus (measured in accordance with ASTM D638) of at least 500 MPa.

14. An artificial grass according to claim 13, characterized in that the material for the cladding has an elasticity modulus (measured in accordance with ASTM D638) of at least 750 MPa.

15. An artificial grass according to any one or more of the preceding claims, characterized in that the thickness of the cladding is such that its volume makes up 1-40% of the volume of the entire fibre.

16. An artificial grass according to any one or more of the preceding claims, characterized in that a compatibility agent has been added to the material for the core and/or to the material for the cladding, or to both materials, which compatibility agent enhances the bond between the material for the core and the material for the cladding.

17. An artificial grass according to claim 16, characterized in that the compatibility agent is a copolymer of ethylene and methyl acrylate.

18. An artificial lawn built up of artificial grass according to any one or more of the preceding claims.

INTERNATIONAL SEARCH REPORT

International application No
PCT/NL2005/000886

A. CLASSIFICATION OF SUBJECT MATTER
INV. D01F8/04 D01F8/06 D01F8/12 E01C13/08

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)
D01F E01C

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 practical, search terms used)
EPO-Internal, PAJ, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2004/106601 A (LANKHORST INDUTECH B.V; ATSMA, FRANKE; WILDSCHUT, DURK) 9 December 2004 (2004-12-09) the whole document	1-4, 11-18
X	EP 0 259 940 A (KONINKLIJKE NIJVERDAL-TEN CATE N.V) 16 March 1988 (1988-03-16) column 2, line 9 - line 23 examples	1-4, 11-18
X	PATENT ABSTRACTS OF JAPAN vol. 2003, no. 12, 5 December 2003 (2003-12-05) & JP 2003 342848 A (HAGIHARA INDUSTRIES INC), 3 December 2003 (2003-12-03) abstract	1-5, 11-18

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

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier document but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
31 March 2006	19/04/2006

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Form PCT/ISA/210 (second sheet) (April 2005)

INTERNATIONAL SEARCH REPORT

International application No
PCT/NL2005/000886

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 99/04074 A (TAPIJTFABRIEK H. DESSEAUX N.V; GEERTS, JAN, FRANS, MARIE) 28 January 1999 (1999-01-28) cited in the application the whole document	1-18
A	US 4 230 752 A (BENEDYK ET AL) 28 October 1980 (1980-10-28) the whole document	8-10
A	US 4 629 654 A (SASAKI ET AL) 16 December 1986 (1986-12-16) the whole document	8-10

INTERNATIONAL SEARCH REPORT

International application No.
PCT/NL2005/000886

Box II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

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

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

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

Box III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☐ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.

2. ☒ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:

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

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest.

☐ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-4 (partly), 7, 11-18 (partly)

An artificial grass built up of fibres that consist of a core and a cladding, in which the material for the core is a polypropylene.
An artificial lawn built up of said artificial grass.

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2. claims: 1-4 (partly), 8-10, 11-18 (partly)

An artificial grass built up of fibres that consist of a core and a cladding, in which the material for the core is ethylene vinyl acetate copolymer.
An artificial lawn built up of said artificial grass.

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3. claims: 1-4 (partly), 11-18 (partly)

An artificial grass built up of fibres that consist of a core and a cladding, in which the material for the core is a saturated styrene thermoplastic elastomer.
An artificial lawn built up of said artificial grass.

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4. claims: 1-4 (partly), 5, 11-18 (partly)

An artificial grass built up of fibres that consist of a core and a cladding, in which the material for the core is a polyamide.
An artificial lawn built up of said artificial grass.

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5. claims: 1-4 (partly), 6, 11-18 (partly)

An artificial grass built up of fibres that consist of a core and a cladding, in which the material for the core is a polyethylene.
An artificial lawn built up of said artificial grass.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/NL2005/000886

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2004106601 A	09-12-2004	AU 2003238715 A1	21-01-2005
		CA 2525826 A1	09-12-2004
EP 0259940 A	16-03-1988	DE 3780543 D1	27-08-1992
		DE 3780543 T2	21-01-1993
		ES 2033298 T3	16-03-1993
		GR 3005414 T3	24-05-1993
		NL 8602312 A	05-04-1988
JP 2003342848 A	03-12-2003	NONE	
WO 9904074 A	28-01-1999	AT 226652 T	15-11-2002
		AU 743445 B2	24-01-2002
		AU 8466198 A	10-02-1999
		DE 69808917 D1	28-11-2002
		DE 69808917 T2	18-06-2003
		EP 0996781 A1	03-05-2000
		ES 2187985 T3	16-06-2003
		NL 1006606 C2	19-01-1999
		NZ 502027 A	27-10-2000
US 4230752 A	28-10-1980	NONE	
US 4629654 A	16-12-1986	JP 1544856 C	15-02-1990
		JP 60231815 A	18-11-1985
		JP 63011443 B	14-03-1988