(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 2 246 476 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
03.11.2010 Bulletin 2010/44

(51) Int Cl.:
E02B 11/00 *(2006.01)*

(21) Application number: **09158962.2**

(22) Date of filing: **28.04.2009**

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO SE SI SK TR

(71) Applicant: **Pipelife Nederland B.V.**
1601 MA Enkhuizen (NL)

(72) Inventor: **Leontaridis, Nikos**
1817 GP Alkmaar (NL)

(74) Representative: **Ketelaars, Maarten F.J.M. et al**
Nederlandsch Octrooibureau
J.W. Frisolaan 13
2517 JS Den Haag (NL)

(54) **Drain system, as well as sleeve for such drain system**

(57) A drain system, comprises a perforated pipe (1) and a filter sleeve (5) surrounding the perforated pipe (1). The filter sleeve (5) comprises a support structure (7) having an outer surface and an inner surface and defining openings (11) which extend between said outer surface and inner surface, as well as at least one porous sheet (6,8) supported by said support structure (7). The support structure (7) comprises e.g. an open cell structure.

EP 2 246 476 A1

Description

[0001] The invention is related to a drain system comprising a perforated pipe and a filter sleeve surrounding the perforated pipe. Such a drain system is widely known, and is primarily used for draining soil which has a relatively high water content. The draining is carried out so as to control the groundwater level, or for other purposes such as cleaning polluted ground.

[0002] An example of such a drain system is disclosed in EP-A-29713.According to another possibility, the filter sleeve consists of a fiber material, for instance coconut fibers. The purpose of this sleeve is to collect particles which are present in the groundwater, and to establish a specific particle size distribution through the thickness of the sleeve. Once a specific pattern of particles has settled through the thickness, a desired filter action is obtained. The larger particles, which bring the risk of choking the perforated pipe, are prevented from entering the drain system whereby a long-term proper draining action can be ensured.

[0003] The filter sleeve thus plays an important role in maintaining the desired particle distribution pattern around the perforated pipe. However, materials such as coconut fibers will generally decompose after some time, which causes loss of support for the particle distribution pattern. In case movements occur in the soil, said pattern is readily lost whereby the desired filter action is no longer ensured. As a result, the perforated drainage pipe runs the risk of being choked.

[0004] Furthermore, drain systems are known consisting of a perforated pipe surrounded by a tubular geotextile sheet. The geotextile prevents particles from a certain size upwards to reach the perforated pipe. Liquid and smaller particles are able to pass the geotextile and may enter the perforations in the pipe for discharge. Ideally, the full surface of the geotextile is available for such filter action. This provides a large filter capacity. The perforated pipe in question is preferably a corrugated pipe, wherein the perforations are situated in the valleys of the corrugations. However, as soon as the geotextile is pressed against the pipe by the earth pressure, the filter action of the geotextile is limited to the spots where it overlies the perforations in the pipe. Thereby, the area of the geotextile which is available for filtration is severely limited, as a result of which the design filter capacity cannot be ensured in the long run.

[0005] The object of the invention is therefore to provide a drain system of the type described before which is more stable in the course of time, in such a way that the long term proper function and design capacity thereof can be ensured. Said object is attained in that the filter sleeve comprises an support structure having an outer surface and an inner surface and defining openings which extend between said outer surface and inner surface, as well as at least one porous sheet supported by said support structure.

[0006] The support structure has a certain rigidity, in such a way that the sheet(s) supported thereby can be held in the desired position with respect to the pipe so as to ensure long term draining capacity. Any particles which pass through the sheet(s) of the drain system, are collected within the pipe for further discharge. As said support structure can be manufactured form e.g. plastics, it is ensured that a long term stability of the drain system is ensured.

[0007] The support structure which is used in the drain system according to the invention can be carried out in several ways. It may have an open cell structure. Such structure can be obtained in many different ways, such as by perforating a plate. Preferably, the tubular grid comprises intersecting and/or welded strips the width direction of which is generally radially oriented with respect to the pipe. Such array of strips may take the form of a honeycomb structure. As an example of an array of strips which is particularly suitable for the drain system according to the invention, reference is made to WO-A-2006/0106101. Said publication discloses a honeycomb structure which consists of plastic strips which are extruded simultaneously in a parallel fashion and which are subsequently adhered to each other locally. By extending the array of strips thus formed in transverse direction, a honeycomb-like structure is obtained which is perfectly fit to serve as a grid for the present sleeve.

[0008] The process of forming the desired particle distribution is enhanced by the cells of the honeycomb structure. The cells are bordered by the sheets, in such a way that a stable package of particles is obtained. Preferably, the porous sheets comprise a geotextile. The properties of the geotextile covering the outer surface of the grid may be different from the properties of the geotextile covering the inner surface.

[0009] The porous sheet may be positioned at different locations with respect to the support structure. For instance, the porous sheet may be positioned on the inner surface of the support structure. Also a position on the outer surface of the support structure is possible. Both the outer surface and the inner surface may be covered by a respective porous sheet. A position within the support structure is also possible. For instance, a porous sheet may be positioned between two support structures which surround each other, e.g. between coaxial support structures.

[0010] The perforated pipe may be a corrugated pipe, although pipes having a constant cross section in longitudinal direction may be used as well in the drain system according to the invention. Also, the perforated pipe may be circular, square, rectangular, triangular. Other shapes with more angles are possible as well.

[0011] Further advantages may be obtained in case the grid and the porous sheets consist of the same material, such as polypropylene or PVC. The porous sheets may comprise a woven, nonwoven, knitted or braided material.

[0012] The invention is also related to a filter sleeve for use in the drain system described before, comprising

a support structure having an outer surface and an inner surface between which openings extend, as well as at least one porous sheet supported by the support structure.

[0013] The invention will furthermore be described with reference to an example shown in the figures.

Figure 1 shows the longitudinal section to the upper part of the drain system according to the invention.
Figure 2 shows a cross-section according to II of figure 1.
Figure 3 shows the view in perspective and in cross-section, partly taken away, of the drain system.
Figure 4 shows the longitudinal section IV-IV according to figure 3.

[0014] The drain system shown in figures 1, 2 and 3 consists of the corrugated pipe I, which is known per se, and which has ring parts 2 with a relatively large diameter and ring parts 3 with a relatively small diameter. These ring parts 2, 3 provide the corrugated pipe 1 with a certain flexibility, which is desirable when laying the corrugated pipe according to bends. The ring parts 3 with relatively small diameter or valleys are provided with openings 4 through which water from the surrounding soil may penetrate into the corrugated pipe 1 for removal.

[0015] The drain system furthermore consists of the filter sleeve 5 which has been provided around the corrugated pipe 1 and which provides a filter action. In this way, it is prevented that the openings 4 in the corrugated pipe 1 become blocked by particles larger than said openings 4. This filter action is obtained by a mechanism according to which the filter sleeve, which has internal open spaces, collects relatively small particles over time during the flow of water into the corrugated pipe 1. This mechanism, which is known per se, leads to the collection of relatively small particles on the radially innermost part of the filter the sleeve. Gradually, larger and larger particles are collected and packed at a radially large a distance, in such a way that particles which are too large for penetrating the openings 4 in the corrugated pipe 1 are kept outside.

[0016] The filter sleeve 5 according to the invention consists of an inner geotextile layer 6, an outer geotextile layer 8 as well as grid like or honeycomb like support layer 7. This honeycomb like layer 7 generally consists of plastic strips 9, 10 Which are adhered to each other which cross each other. These strips 9, 10 define apertures 11 which form the spaces within which the packing 12 of particles described before can be obtained, as shown in figure 4. As mentioned before, relatively fine particles 13 contact near the inner sheet 6, whereas relatively course articles 14 collect more to the outside of the outer sheet 8.

[0017] The drain system as described before is accommodated within a prepared trajectory, such as a groove, in a bottom to be drained. The filter sleeve ensures that particles above a certain size barred from entering the corrugated pipe, in such a way that the long term drain action can be ensured.

Claims

1. Drain system, comprising a perforated pipe (1) and a filter sleeve (5) surrounding the perforated pipe, **characterized in that** the filter sleeve comprises a support structure (7) having an outer surface and an inner surface and defining openings (11) which extend between said outer surface and inner surface, as well as at least one porous sheet (6, 8) supported by said support structure (7).

2. Drain system according to claim 1, wherein the support structure (7) comprises an open cell structure.

3. Drain system according to claim 1 or 2, wherein the support structure (7) comprises intersecting and/or welded strips (9, 10) the width direction of which is generally radially oriented with respect to the pipe.

4. Drain system according to any of the preceding claims, wherein the support structure (7) comprises a honeycomb structure.

5. Drain system according to any of the preceding claims, wherein the porous sheet (6, 8) comprises a geotextile.

6. Drain system according to any of the preceding claims, wherein the outer surface of the support structure (7) is covered by a porous sheet (8).

7. Drain system according to any of the preceding claims, wherein the inner surface of the support structure (7) is covered by a porous sheet (6).

8. Drain system according to any of the preceding claims, wherein the perforated pipe is a corrugated pipe (1).

9. Drain system according to claim 8, wherein the corrugated pipe (1) comprises a valley sections (3) and hill sections(2), wherein the valley sections (3) are provided with openings(4).

10. Drain system according to any of the preceding claims, wherein the perforated pipe (1) is circular.

11. Drain system according to any of the preceding claims, wherein the support structure (7) and the porous sheets (6, 8) consist of the same material, such as polypropylene or PVC.

12. Drain system according to any of the preceding claims, wherein the porous sheets (6, 8) comprise a

woven, nonwoven, knitted or braided material.

13. Filter sleeve (5) for a drain system according to any of the preceding claims, said filter sleeve comprising a support structure (7) having an outer surface and an inner surface between which surfaces openings extend, as well as at least one porous sheet (6, 8) supported by said support structure (7).

Fig. 1

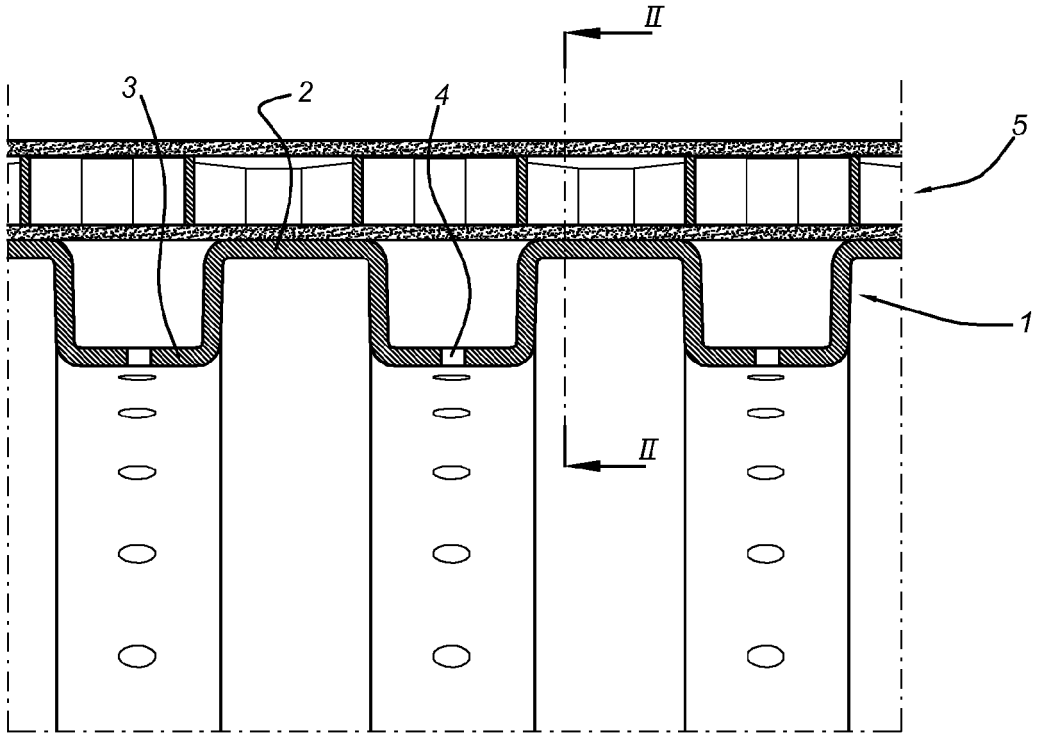
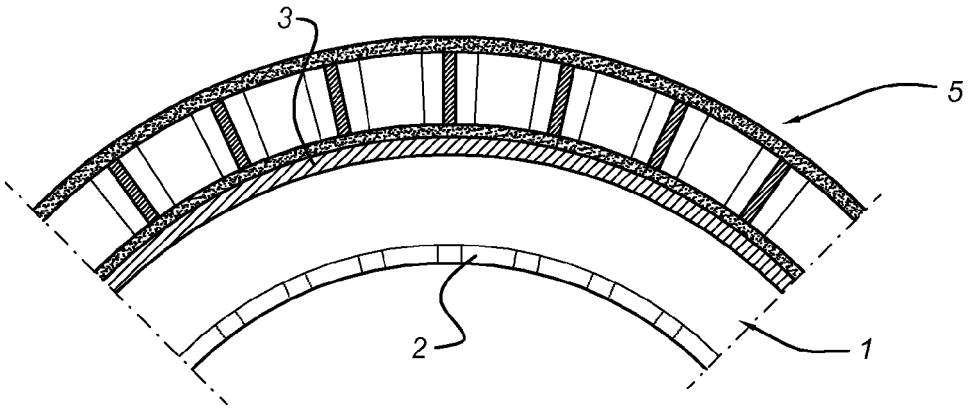


Fig. 2



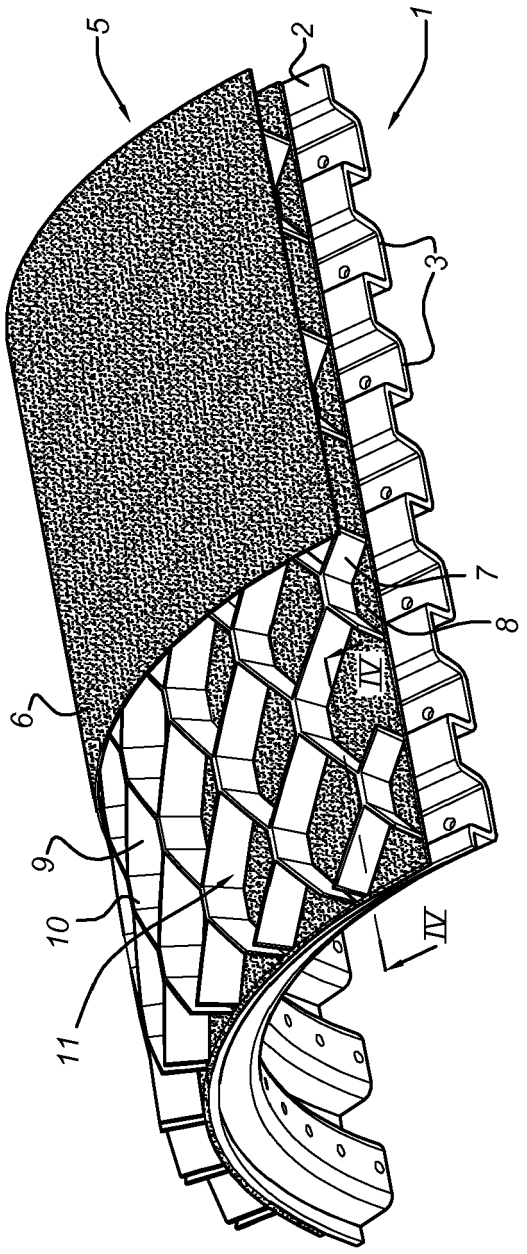
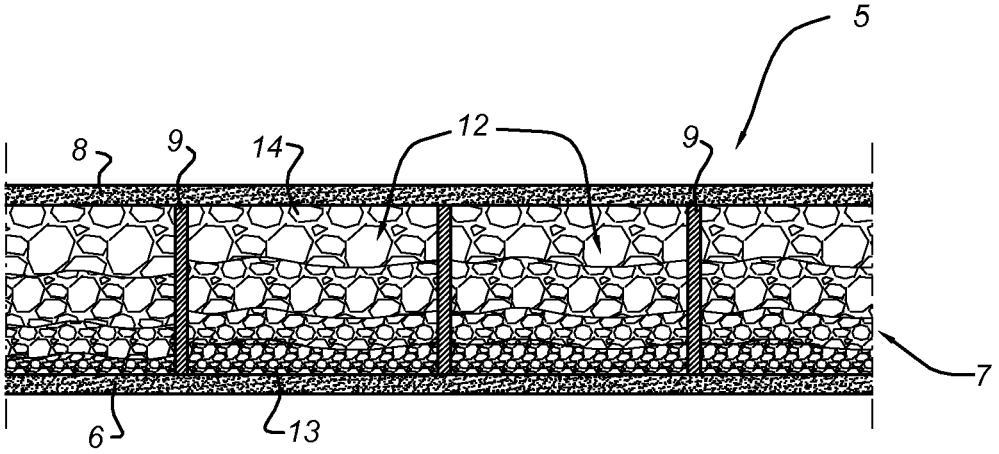


Fig. 3

Fig. 4



Europäisches Patentamt
European Patent Office
Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 09 15 8962

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	CA 1 235 911 A1 (STEELE IRVING A) 3 May 1988 (1988-05-03) * the whole document *	1-4	INV. E02B11/00
X Y	EP 0 033 570 A1 (WAVIN BV [NL]) 12 August 1981 (1981-08-12) * figure 1 *	1-2 3-4	
X Y	DE 154 794 C (LAPP H.) 8 November 1903 (1903-11-08) * the whole document *	1-2 3-4	
Y	DE 195 18 602 A1 (STEIN CADENBACH BERND [DE]) 28 November 1996 (1996-11-28) * the whole document *	3-4	
X	GB 1 210 158 A (NEUMANN GUNTER [AT]) 28 October 1970 (1970-10-28) * figure 4 *	1	
X	US 4 204 967 A (BANNISTER ALAN S [GB]) 27 May 1980 (1980-05-27) * figure 1 *	1	TECHNICAL FIELDS SEARCHED (IPC) E02B B01D
X	AU 613 940 B2 (YAMAMOTO AKIO) 15 August 1991 (1991-08-15) * figures 17,18 *	1	

~~The present search report has been drawn up for all claims~~

Place of search	Date of completion of the search	Examiner
Munich	10 September 2009	Geisenhofer, Michael

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

2

EPO FORM 1503 03.82 (P04C01)

Europäisches Patentamt
European Patent Office
Office européen des brevets

Application Number
EP 09 15 8962

CLAIMS INCURRING FEES

The present European patent application comprised at the time of filing claims for which payment was due.

☐ Only part of the claims have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due and for those claims for which claims fees have been paid, namely claim(s):

☐ No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due.

LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

see sheet B

☐ All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.

☐ As all searchable claims could be searched without effort justifying an additional fee, the Search Division did not invite payment of any additional fee.

☐ Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid, namely claims:

☒ None of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims, namely claims:

s. additional sheets

☐ The present supplementary European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims (Rule 164 (1) EPC).

Europäisches Patentamt
European Patent Office
Office européen des brevets

LACK OF UNITY OF INVENTION
SHEET B

Application Number
EP 09 15 8962

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

1. claims: 1-4, 13

   details of the support structure
   ---

2. claims: 5-7

   details of the porous sheet
   ---

3. claims: 8-10

   details of the perforated pipe
   ---

4. claims: 11-12

   details concerning choice of materials

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 09 15 8962

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

10-09-2009

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
CA 1235911 A1	03-05-1988	NONE	
EP 0033570 A1	12-08-1981	NL 8000496 A	17-08-1981
DE 154794 C		NONE	
DE 19518602 A1	28-11-1996	NONE	
GB 1210158 A	28-10-1970	BE 719227 A	16-01-1969
		BG 17827 A3	25-12-1973
		CH 478962 A	30-09-1969
		CS 150604 B2	04-09-1973
		DE 1782019 A1	11-11-1971
		DK 119957 B	15-03-1971
		ES 356917 A1	16-02-1970
		NL 6811266 A	11-02-1969
		NO 124274 B	27-03-1972
US 4204967 A	27-05-1980	AU 523308 B2	22-07-1982
		AU 4202578 A	07-06-1979
		CA 1094951 A1	03-02-1981
		DE 2852108 A1	07-06-1979
		FR 2412665 A1	20-07-1979
		GB 1601706 A	04-11-1981
		JP 1125304 C	30-11-1982
		JP 54086872 A	10-07-1979
		JP 57012404 B	10-03-1982
		NL 7811737 A	06-06-1979
		ZA 7806750 A	28-11-1979
AU 613940 B2	15-08-1991	AU 2064788 A	15-02-1990

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- EP 29713 A **[0002]**
- WO 20060106101 A **[0007]**