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

(11) EP 1 001 086 A1

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
17.05.2000 Bulletin 2000/20

(51) Int. Cl.[7]: **E01C 11/22**

(21) Application number: **99203829.9**

(22) Date of filing: **16.11.1999**

(84) Designated Contracting States:
AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU MC NL PT SE
Designated Extension States:
AL LT LV MK RO SI

(30) Priority: **16.11.1998 NL 1010563**

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(54) Paving element and street provided with a series of such paving elements

(57) A paving element manufactured from water-permeable material, wherein a pipe section (2) provided with a number of inlet openings (3) is included in the paving element, the pipe section (2) being connectable to a first water discharge system (6), and the inlet openings (3) being provided in the paving element. A street provided with a series of such paving elements.

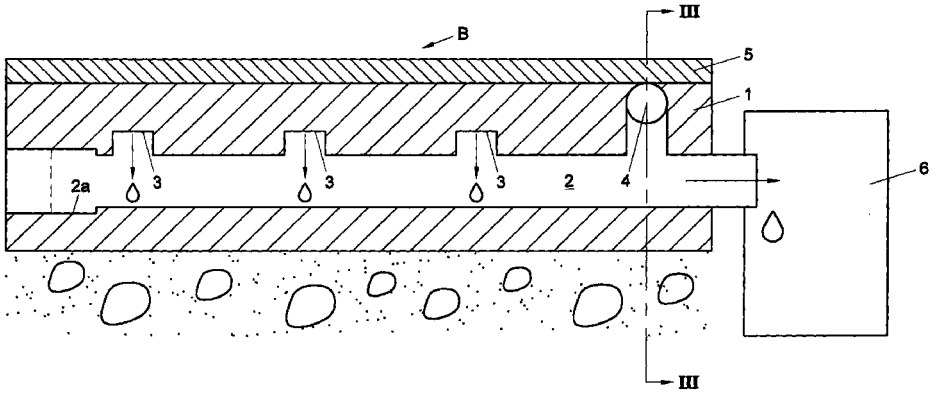

Fig. 1

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Description

[0001] The invention relates to a paving element manufactured from water-permeable material.

[0002] Such paving elements are, for instance, known from Dutch patent application NL-A-9301143. The paving elements described therein are provided with an upper water-permeable layer and a lower watertight layer. The known paving elements are particularly intended for paving large surfaces, such as streets, sidewalks, squares and the like. They have the advantage that the water is not left on the upper surface of the paving element but directly sinks into the paving element, until it reaches the watertight layer. This watertight layer is preferably somewhat inclined, so that the water within the paving elements flows in a specific direction, preferably to a drain. The drains carry the water to the sewer. DE-A-40 22 568 discloses a fully water-permeable paving element.

[0003] At present a development is in progress to carry not all the rainwater to the sewer, but to return it to the ground, so that the groundwater level is maintained. However, in case of very heavy rainfall the supply of water can be such that not all the water can be directly taken up in the ground but must be discharged to temporary storage basins, such as, for instance, a pond, a ditch, a wadi or a so-called infiltration pit in which the water is temporarily stored, and from which it slowly infiltrates into the soil. A wadi is an area which in case of heavy rainfall is allowed to flood so as to form a kind of buffer for the excess rainwater. In periods of drought these wadis serve as buffer for keeping up the groundwater level. Moreover, circumstances are conceivable that the rainfall is such that even the ponds, wadis, ditches and infiltration pits can no longer cope with the water. In these circumstances it is necessary to carry water to the sewer, so that it can be discharged from the rainy area.

[0004] Dewatering installations for streets in the form of drains are known from practice. The inlet openings of these drains are situated near the longitudinal edges of the street in the so-called upright course of the street. The drains are provided with a first discharge possibility by infiltration from the drain to the ground. When the flow rate becomes unduly high, the excess water can be carried via an overflow to a rainwater pipe. When the rainwater pipe which carries the water, for instance to a pond, ditch, wadi or the like, can no longer cope with the water, the water is discharged to the sewer by means of a second overflow.

[0005] A drawback of this known construction is that infiltration of rainwater into the ground takes place only at the drain. Consequently, a relatively small infiltration area is available. Another drawback of the known installation is the cost price of the specifically designed drain and the pertaining rainwater pipes with overflow possibilities to the sewer pipes. The known construction is so expensive that it is not yet frequently used in practice. Moreover, the street must be broken up to install the rainwater pipes and the different overflow provisions. This involves considerable cost and additionally causes a lot of traffic trouble.

[0006] The invention has for its object to provide a water-permeable paving element, so that the water can penetrate into the underground, which also has the possibility of discharging the excess rainwater in case of very heavy rainfall, without requiring the above expensive construction.

[0007] The invention therefore provides a paving element manufactured from water-permeable material, a pipe section provided with at least one inlet opening being included in the paving element, the pipe section being connectable to a first water discharge system, and the at least one inlet opening being provided in the paving element.

[0008] The water permeability of the material from which the paving element is manufactured naturally offers some resistance to the permeation of water. The extent of this resistance depends on the amount of open space in the material. In case of much open space the resistance will be low, while in case of a small open space the resistance is higher. The amount of open space in the material depends, inter alia, on the size of the particles from which the material is built up. As a result of the resistance to the permeation of water, a large supply of water, for instance as a result of heavy rainfall, will raise the water level in the paving element. The water level within the paving element will continue to rise, until it reaches the at least one inlet opening of the pipe section. Via these inlet openings the excess water will enter the pipe section where it will sustain less resistance than in the water-permeable material, so that a rapid discharge of the water is possible. Thus, in case of not unduly heavy rainfall the rainwater can be taken up in the ground below the paving element, while in case of heavier rainfall the water not to be taken up in the underground is discharged via the pipe section. It is self-evident that the pipe sections must be connected to a water discharge system. Such a water discharge system may, for instance, lead to a pond, a ditch, a wadi, an infiltration pit or such a water reservoir. Optionally, the water discharge system may also be connected to the sewer.

[0009] According to a further elaboration of the invention it is very favorable if an overflow pipe is connected to the pipe section, a part of the overflow pipe extending above the level of the inlet openings, and the overflow pipe being connectable to a second water discharge system.

[0010] Because an overflow pipe is connected to the pipe section, it becomes possible to discharge the rainwater in three ways. In case of not unduly heavy rainfall the rainwater will penetrate into the underground via the permeable material of the paving element. When the rainfall is such that the water level within the paving element reaches the inlet openings, a part of the water

will be carried via the pipe section to a first water discharge system. The first water discharge system can lead the water, for instance, to a ditch, a pond, a wadi and/or an infiltration pit. Thus the rainwater remains available for use at a later time, during a period of drought, for irrigating the land, or in the case of wadis or infiltration pits, for gradual uptake in the underground. When within the paving element the water level rises even further as a result of very heavy rainfall, a part of the water flowing in the pipe section will be discharged via the overflow pipe, which is connected to the pipe section, to the second water discharge system. This second water discharge system may, for instance, be formed by the sewer.

[0011] According to an alternative further elaboration of the invention the paving element may be provided with a first pipe section having first inlet openings and a second pipe section having second inlet openings, the first inlet openings being situated at another level between a lower side and an upper side of the paving element than the second inlet openings, the first pipe section being connectable to a first water discharge system, and the second pipe section being connectable to a second water discharge system.

[0012] In this alternative further elaboration, too, it is possible that in case of light rainfall the water infiltrates into the ground, that in case of a somewhat heavier rainfall is also carried to a ditch, a pond, a wadi, an infiltration pit or such a reservoir, and that in case of very heavy rainfall the excess water is carried to, for instance, the sewer.

[0013] Preferably, the dimensions of the paving element are such that it can be placed in the position of the upright course of a street. Such paving elements can simply be fitted in with existing infrastructure without requiring the removal of the road surface. Consequently, only very few infrastructural operations are necessary, which considerably limits the required investments. The paving elements can be laid in series with the end faces against each other, at the same time a connection being effected between the pipe sections of the successive paving elements, so that a pipe is formed. Preferably, the successive paving elements are somewhat inclined, so that the water in the pipe formed by the successive pipe sections automatically flows in a specific direction. Optionally, sand collecting pits may be provided every so many meters between two successive paving elements, so that sand particles included in the water-permeable material can migrate to the sand collecting pits through the water-permeable material of the paving element.

[0014] The invention also relates to a street provided with a series of paving elements according to the invention, the pipe formed by the interconnected pipe sections of the series of paving elements lying with the end faces against each other being connected to a water discharge system or, when the pipe sections of the paving elements are connected to an overflow pipe, or when the paving elements are provided with first and second pipe sections, being connected to a first and a second water discharge system.

[0015] Further elaborations of the invention are described in the subclaims and will be further explained on the basis of two exemplary embodiments, with reference to the drawing.

[0016] It should be noted that DE-A-44 28 482 discloses a paving element provided with an internal pipe section or at least a throughbore for discharging excess water to a water discharge system. However, this known paving element is not manufactured from water-permeable material. Via passage openings between two successive paving elements water can flow into the underground, and in case of a large water supply water can be discharged via the throughbore in the paving element to the water discharge system. It may be clear that such passage openings can be easily clogged, so that discharge of rainwater to the underground or the throughbore is fully prevented.

Fig. 1 is a cross-sectional view taken on the line I-I from Fig. 3 of a first exemplary embodiment of the paving element according to the invention;

Fig. 2 is a cross-sectional view of a street bounded on both sides by paving elements of the type shown in Fig. 1;

Fig. 3 is a cross-sectional view taken on the line III-III from Fig. 1, at a drain;

Fig. 4 shows a part of a street at a drain, which street is bounded by a sidewalk; and

Figs. 5-8 are a number of cross-sectional views of a second exemplary embodiment of a paving element according to the invention.

[0017] The exemplary embodiment shown in Fig. 1 shows a cross-sectional view of a paving element B manufactured from water-permeable material 1. The water-permeable material 1 may, for instance, be polymer concrete having an open structure. Included in the paving element B is a pipe section 2 provided with a number of inlet openings 3. The paving element B shown in the present exemplary embodiment has a form suitable for being placed in the upright course of a street 8. The successive paving elements B then come to lie with the end faces against each other, with the different pipe sections 2 of the successive paving elements B being interconnected. There is thus formed a pipe connectable to a water discharge pipe system. As referred to herein, a water discharge system is a pipe system, such as for instance the sewer, or a pipe system leading to a pond, a wadi, an infiltration pit or a ditch. However, a water discharge system may also be formed by a basement box, which is a reservoir through which the water can slowly infiltrate into the ground. Optionally, the water discharge system may also be formed by a perforated pipe driven deeply into the ground, so that the water can infiltrate into the ground via this pipe. Fig.

1 diagrammatically shows a basement box 6, although not to scale with respect to the paving element B. Connected to the pipe section 2 is an overflow pipe 4. A part of the overflow pipe 4 extends above the level of the inlet openings 3. The overflow pipe 4 is connectable to a second water discharge pipe system. The second water discharge pipe system may, for instance, be formed by the sewer.

[0018] Furthermore, the paving element B of the present exemplary embodiment is provided at the upper side with a filter layer 5, which prevents the water-permeable material 1 of the paving element from being clogged with street garbage. The filter layer 5 can, for instance, be built up from polymer concrete having a granular size less than 3 mm.

[0019] The granular size of the water-permeable material 1 may, for instance, range between 4 and 10 mm.

[0020] Fig. 2 is a cross-sectional view of a street 8 provided on both sides with paving elements B according to the invention. It should be noted that the ratio between the width of the street 8 and the size of the paving elements B in the present drawing is not in agreement with reality. The width of the paving elements B shown in Fig. 2 is such that they can be positioned in the upright course of the street 8. Clearly visible are the water-permeable material 1, the filter layer 5 and the cross section of the pipe 2. The street surface is somewhat inclined, so that the rainwater falling on the street 8 flows to the paving elements B.

[0021] Fig. 3 is a cross-sectional view of a paving element B positioned in the upright course of a street. The cross section of Fig. 3 is taken at a drain or gully 7. Clearly visible is that the overflow pipe 4 of the paving element B opens into the drain 7.

[0022] Fig. 4 shows a variant of the street 8 of Fig. 3, a sidewalk 9 being arranged along the street 8. Positioned in the sidewalk 9 as well as in the street 8 is a series of paving elements B' and B, respectively. In order to keep the more polluted water from the street 8 separated from the less polluted water from the sidewalk 9, it is very favorable if the pipe 2' of the paving element B' situated at the sidewalk 9 opens into another water discharge system than the pipe 2 of the paving element B located in the upright course of the street 8. Only in case of very heavy rainfall such that the overflows 4' and 4 become active, the excess water from the sidewalk 9 and the street 8, respectively, will be discharged into the drain 7.

[0023] Fig. 5 is a cross-sectional view taken on the line V-V from Figs. 7 and 8. Fig. 6 is a cross-sectional view taken on the line VI-VI from Figs. 7 and 8. Fig. 7 is a cross-sectional view taken on the line VII-VII from Fig. 5, and Fig. 8 is a cross-sectional view taken on the line VIII-VIII from Fig. 6. The exemplary embodiment B2 shown in these figures is manufactured from water-permeable material 11. At an upper side the paving element B2 is provided with a filter layer 12. The filter layer 12 is also water-permeable but has a finer granular structure than the water-permeable material 11 so as to prevent clogging of the water-permeable material 11 with street garbage.

[0024] The paving element B2 of this exemplary embodiment is provided with a first pipe section 13 having first inlet openings 14. The paving element B2 further contains a second pipe section 15 having second inlet openings 16. The first pipe section 13 is connectable to a first water discharge system such as, for instance, a basement box, an infiltration pit or a pipe system leading to a pond, a ditch or a wadi. The second pipe section 15 is connectable to a second water discharge system which is, for instance, formed by the sewer. The first inlet openings 14 are situated at a lower level within the paving element B2 than the second inlet openings 16.

[0025] It applies to the exemplary embodiment shown in Figs. 1-4 as well as to the exemplary embodiment shown in Figs. 5-8 that the pipe sections 2, 13, 15 are provided at one end with a socket 2a, 13a, 15a in which the other end of the corresponding pipe section of an adjacent paving element B, B2 can be fittingly received. Although not shown, the paving elements B, B2 may be provided at one end face thereof with a tongue and at the other end face thereof with a mating groove, so that mutual displacement of paving elements B, B2 lying with the end faces against each other is prevented.

[0026] The operation of the paving elements shown is as follows: when it is raining gently and there is therefore a moderate supply of water, the water from the street 8 or the sidewalk 9 will flow to the paving elements B or B2. As a result of the water permeability of the filter layer 5 or 12 and the water-permeable material 1 or 11, the water will be able to penetrate into the underground via the paving elements B, B2. The underground takes up the water, so that desiccation or a drop in the groundwater level is inhibited. Because paving elements permeating water to the underground are arranged over substantially the entire length of the street, no concentration of pollution takes place. The self-cleaning action of the soil can therefore be optimally utilized. In case of somewhat heavier rainfall the water level within the paving elements B, B2 will rise slowly as a result of the flow resistance which the water in the paving element B, B2 and in the underground below the paving element sustains. At a certain moment the water level within the paving element B, B2 will have risen such that it reaches the inlet openings 3 or 14. Via these inlet openings the water will enter the pipe sections 2 or 13 and be discharged via this pipe 2 or 13 to, for instance, a wadi, a pond, a ditch, an infiltration pit, a basement box or such a water discharge system for discharging water that cannot be taken up directly into the underground. In case of very heavy and prolonged rainfall it may occur that even the discharge via the pipe 2 or 13 is insufficient. In that case both exemplary embodi-

ments B, B2 provide the possibility of discharging the excess water to a second water discharge system. In the first exemplary embodiment this possibility is created by connecting an overflow pipe 4 to the pipe 2. When the water level within the paving element B rises to the level of the overflow pipe 4, water will be discharged via the overflow pipe 4 as a result of the action of the communicating vessels. As clearly shown in Figs. 3 and 4, the overflow pipe 4 can open into a drain, so that the excess water can be discharge via the drain and the sewer system connected thereto.

[0027] In the second exemplary embodiment a second pipe section 15, instead of an overflow pipe 4, is included in the paving element B2. This second pipe section, too, is provided with inlet openings 16 which, however, are situated at a higher level in the paving element B2 than the first inlet openings 14. Only when the water level within the paving element B2 has risen to the level of the second inlet openings 16, the second pipe section 15 will be filled with excess water which can be carried to a second water discharge system.

[0028] An important advantage of the exemplary embodiments of the paving elements B, B2 shown is that they can be positioned in the upright course of the road without requiring that the road is broken up. Thus, a high-grade water discharge system is rather simply created which prevents desiccation of the underground, and which in case of heavy rainfall can yet adequately discharge the water. When the underground is not suitable for directly taking up water therein, a closing layer may be arranged at the bottom and, if required, at the sides of the paving element B, so that the paving element essentially forms a kind of gutter. Such a closing layer may, for instance, be formed by a film or by a layer of very fine-granular polymer concrete. The water permeability of the materials 1 or 11 can then be used to carry water in the longitudinal direction of the paving element to a collecting point, such as, for instance, a basement box or an infiltration pit.

[0029] Although in the exemplary embodiments shown the inlet openings 3, 14, 16 are formed by inlet openings of pipe stubs perpendicular to the pipe sections 2, 13, 15, it is also possible that the inlet openings are formed by throughbores in the walls of the pipe sections 2, 13, 15. It is even possible that the pipe section is formed by a throughbore in the water-permeable material, only the lower side of the throughbore being made watertight, for instance by means of a coating, so that a kind of gutter is formed in the paving element. The inlet opening is then formed by the still water-permeable upper side of the throughbore. The upper edge of the watertight lower side of the throughbore then forms the boundary of the inlet opening. It should further be noted that a paving element B which is not provided with an overflow pipe 4 or a second pipe section 15 for discharging excess water to a second water discharge system, but which is provided with a single pipe section for discharging water to a first water discharge system, also falls within the scope of the present invention. The paving element according to the invention is further eminently suited for use in a water-permeable road surface which is provided at the lower side with a closing layer. In such a road surface the water falling thereon will flow via the closing layer to the paving element where it can penetrate into the paving element via a side wall of the paving element. It is self-evident that the application possibilities are not limited to streets but also comprise squares, promenades and the like. Furthermore, installation in the middle of the street, instead of at the upright course, is within the bounds of possibility.

Claims

1. A paving element manufactured from water-permeable material, wherein a pipe section (2, 13, 15) provided with at least one inlet opening (3, 14, 16) is included in the paving element (B, B2), the pipe section (2, 13) being connectable to a first water discharge system (6), and the inlet openings (3, 14, 16) being provided in the paving element (B, B2).

2. A paving element according to claim 1, characterized in that the at least one inlet opening (3, 14, 16) is situated between a lower side and an upper side of the paving element (B, B2), at least a lower side of the pipe section (2, 13, 15) extending between the at least one inlet opening (3, 14, 16) and the lower side of the paving element (B, B2).

3. A paving element according to claim 1, characterized in that at least the lower side of the pipe section is watertight, so that the pipe section (2, 13, 15) forms a gutter in the paving element, the at least one inlet opening (3, 14, 16) being bounded by the upper edge of the gutter-shaped watertight part of the pipe section.

4. A paving element according to any of claims 1-3, characterized in that an overflow pipe (4) is connected to the pipe section (2), a part of the overflow pipe (4) extending above the level of the inlet openings (3), and the overflow pipe (4) being connectable to a second water discharge system (7).

5. A paving element according to any of claims 1-3, characterized in that it contains a first pipe section (13) having first inlet openings (14) and a second pipe section (15) having second inlet openings (16), the first inlet openings (14) being situated at another level between a lower side and an upper side of the paving element (B2) than the second inlet openings (16), the first pipe section (13) being connectable to a first water discharge system (6), and the second pipe section (15) being connectable to a second water discharge system (7).

6. A paving element according to any of the preceding claims, characterized in that the dimensions thereof are such that it can be placed in the position of the upright course of a street (8).

7. A paving element according to any of the preceding claims, characterized in that the or each pipe section (2, 13, 15) in the paving element (B, B2) is provided at one end with a socket (2a, 13a, 15a) in which the other end of the corresponding pipe section (2, 13, 15) of an adjacent paving element (B, B2) can be fittingly received.

8. A paving element according to any of the preceding claims, characterized in that one end face thereof is provided with a tongue and the other end face thereof is provided with a mating groove, so that mutual displacement of paving elements (B, B2) lying with the end faces against each other is prevented.

9. A paving element according to any of the preceding claims, characterized in that the water-permeable material (1, 11) is plastic-bound gravel.

10. A paving element according to claim 9, characterized in that the open space in the plastic-bound gravel is 6-50%.

11. A paving element according to any of the preceding claims, characterized in that it is provided at the upper side with a water-permeable filter layer (5, 12) having a smaller granular size than the other water-permeable material (1, 11) from which the paving element (B, B2) is manufactured.

12. A street provided with a series of paving elements (B, B2) according to any of the preceding claims, wherein the pipe formed by the interconnected pipe sections (2, 13) of the series of paving elements (B) lying with the end faces against each other is connected to a first water discharge system (6).

13. A street according to claim 12, provided with paving elements (B, B2) according to claim 3 or 4, wherein the first pipe formed by the interconnected first pipe sections (2, 13) of the series of paving elements (B, B2) lying with the end faces against each other is connected to a first water discharge system (6), the overflow pipes (4) or the second pipe formed by the interconnected second pipe sections (15) of the series of paving elements (B2) lying with the end faces against each other being connected to a second water discharge system (7).

14. A street according to claim 13, characterized in that the first water discharge system (6) carries the water to a pond, a wadi, a ditch, an infiltration pit, a basement box or such a water reservoir, the second water discharge system being formed by the sewer.

15. A street according to any of claims 12-14, characterized in that it is bounded at at least one longitudinal side by a sidewalk (9), the sidewalk (9) being provided with a series of paving elements (B, B2) according to any of the preceding claims 1-11, a pipe formed by the interconnected pipe sections (2, 13) of this series of paving elements (B, B2) lying with the end faces against each other being connected to a water discharge system which is separated from the water discharge system to which the at least one pipe (2, 13) is connected which is formed by the pipe sections in the series of paving elements (B, B2) located at the upright course of the street (8).

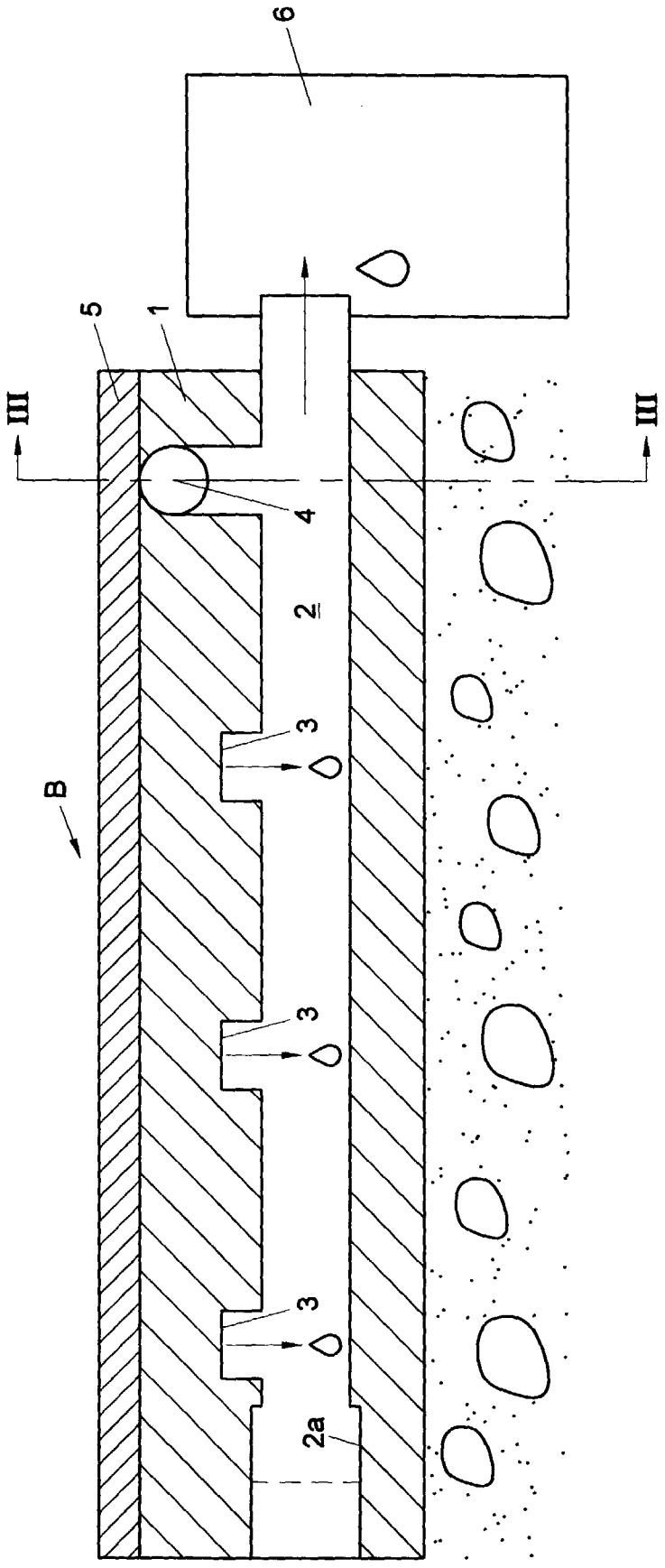

Fig. 1

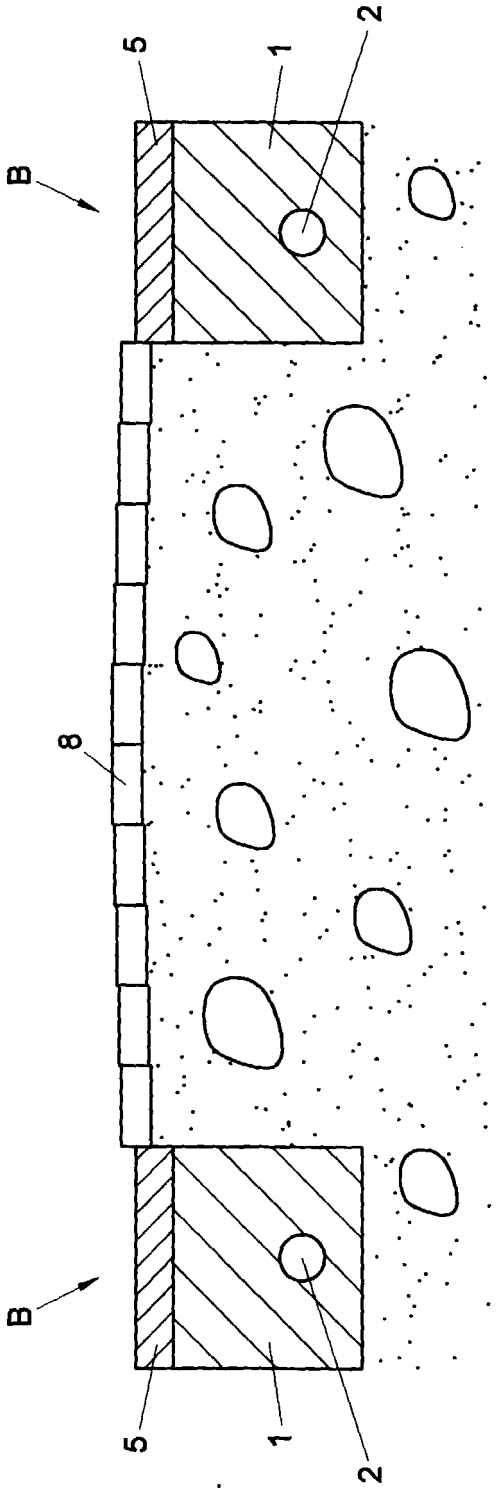

Fig. 2

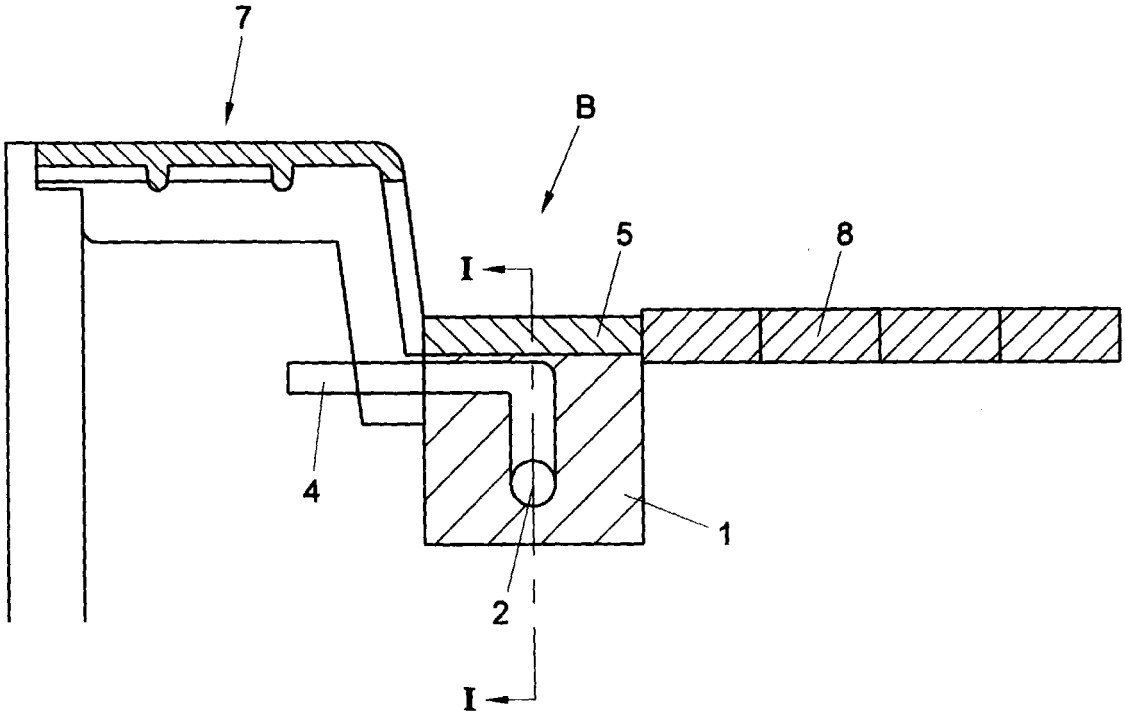

Fig. 3

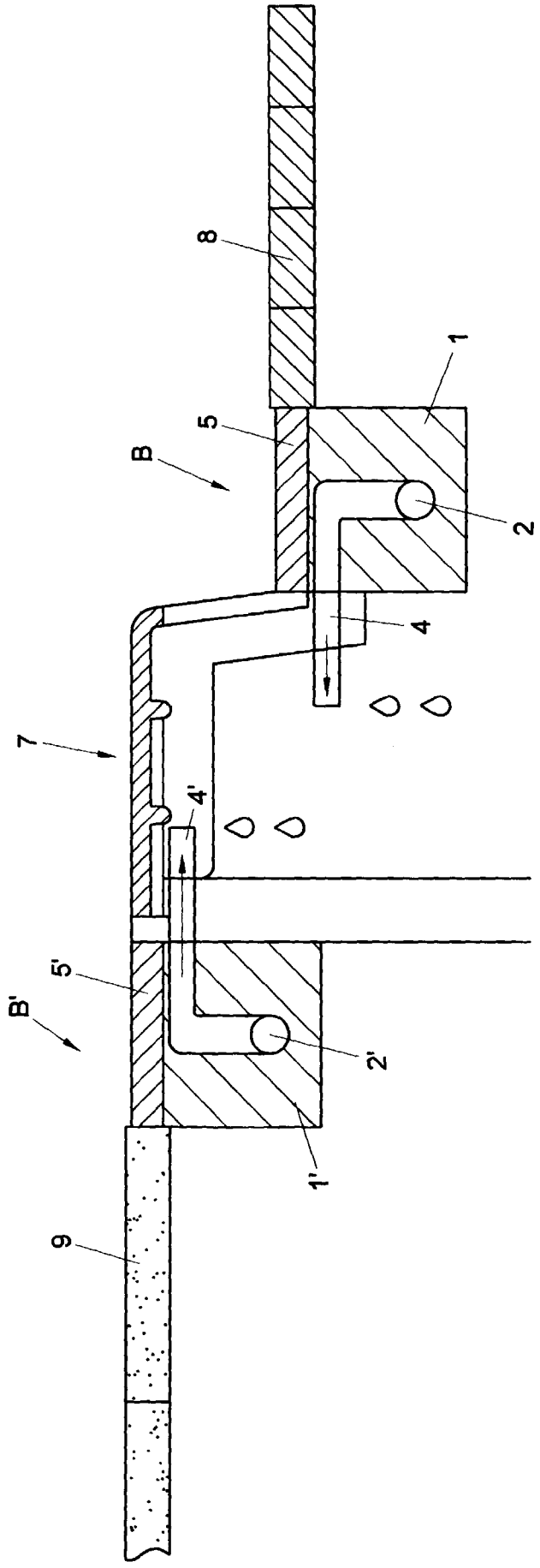

Fig. 4

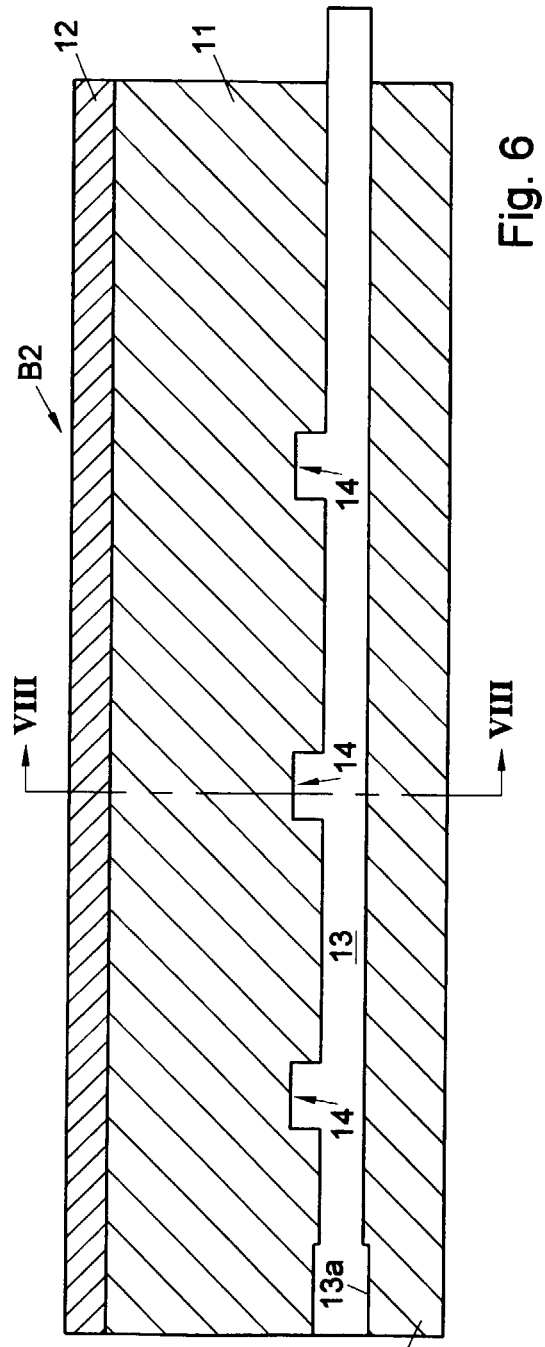

Fig. 6

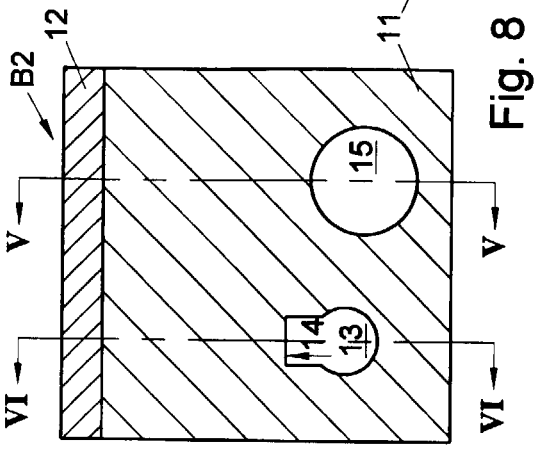

Fig. 8

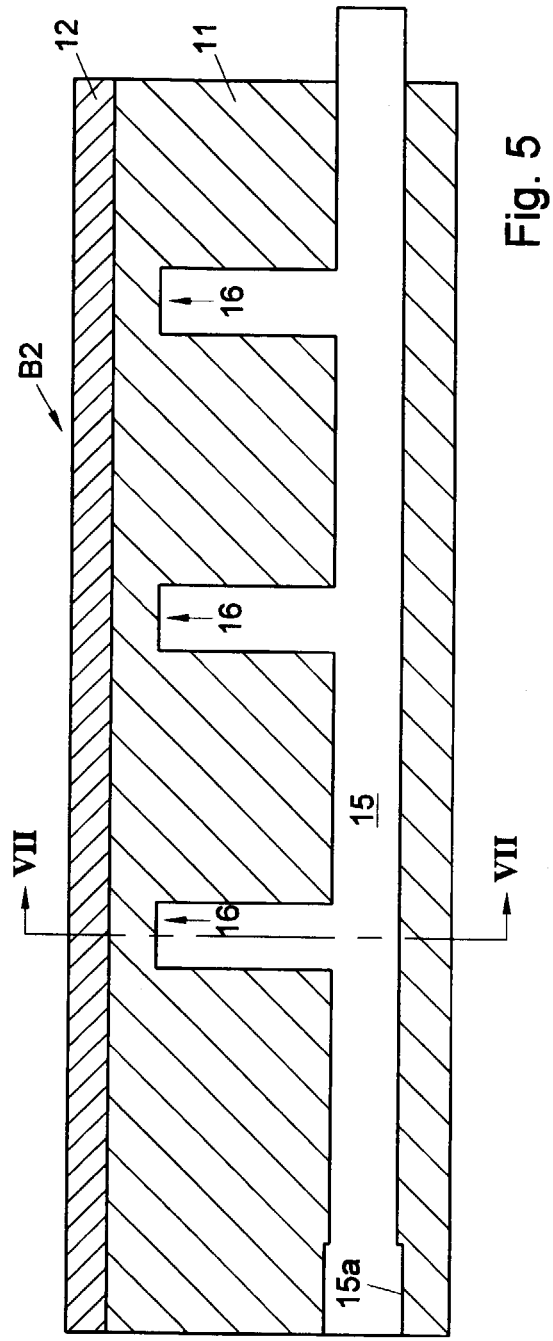

Fig. 5

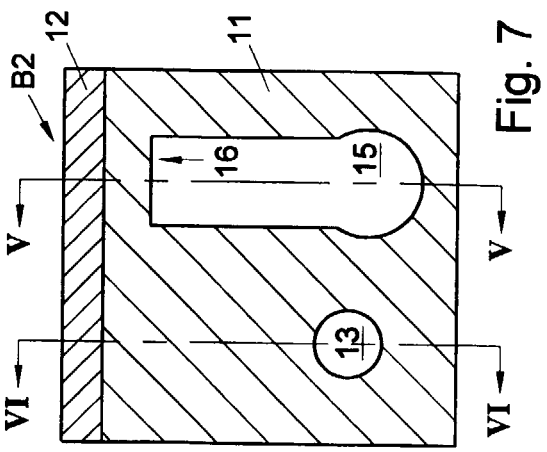

Fig. 7

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 99 20 3829

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
X Y A	DE 36 17 471 A (MATTHAEI BAUUNTERNEHMEN GMBH &) 19 March 1987 (1987-03-19) * the whole document *	1-3,6-8,12 4,9-11 15	E01C11/22
D,Y A	DE 44 28 482 A (KLOSTERMANN) 15 February 1996 (1996-02-15) * the whole document *	4 1,2,6,12	
Y A	DE 43 20 118 A (HENKEL KGAA ;AUSRUESTUNG FUER KLEBE UND GIE (DE)) 22 December 1994 (1994-12-22) * column 6, line 65 - column 7, line 23 *	9,10 1,11	
D,Y A	DE 40 22 586 A (ZAPF WERNER KG) 8 August 1991 (1991-08-08) * abstract; figures *	11 1	
X	DE 29 10 644 A (KOWALSKI ARNOLD) 18 September 1980 (1980-09-18) * the whole document *	1,2,6	

TECHNICAL FIELDS SEARCHED (Int.Cl.7)

E01C

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	16 February 2000	Dijkstra, G

CATEGORY OF CITED DOCUMENTS

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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 99 20 3829

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16-02-2000

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 3617471 A	19-03-1987	NONE	
DE 4428482 A	15-02-1996	NONE	
DE 4320118 A	22-12-1994	AU 7000194 A	17-01-1995
		AU 686195 B	05-02-1998
		AU 7184394 A	17-01-1995
		BG 100224 A	30-09-1996
		BG 100225 A	30-09-1996
		CN 1125453 A,B	26-06-1996
		CN 1125454 A	26-06-1996
		CZ 9502854 A	14-02-1996
		CZ 9503032 A	13-03-1996
		DE 59406784 D	01-10-1998
		WO 9500568 A	05-01-1995
		WO 9500569 A	05-01-1995
		EP 0703933 A	03-04-1996
		EP 0711313 A	15-05-1996
		ES 2120057 T	16-10-1998
		HU 73348 A	29-07-1996
		HU 73865 A	28-10-1996
		PL 312249 A	01-04-1996
		PL 312250 A	01-04-1996
		RO 114139 A	29-01-1999
		US 5648421 A	15-07-1997
DE 4022586 A	08-08-1991	AT 104008 T	15-04-1994
		DE 9116773 U	18-11-1993
		DE 59101318 D	11-05-1994
		EP 0471978 A	26-02-1992
DE 2910644 A	18-09-1980	NONE	

EPO FORM P0459

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