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(54) **Drainage element**

Oberflächenablaufeement

Elément de drainage

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• **PATENT ABSTRACTS OF JAPAN vol. 017, no. 459
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106267 A (SHIYOUSEKI KAKO KK; others: 01), 27
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Description

[0001] This invention relates to a drainage element and a drainage system comprising such drainage elements.

[0002] JP-A-05106267 describes a drainage element according to the preamble of claim 1.

[0003] To handle liquid run-off from surfaces, in particular rainwater and storm water run off from areas such as roads and car parks, it is conventional to provide a drainage system which includes a number of channels to collect the water and direct the water to a disposal system, such as a mains drainage network. The channels may, for example, comprise channels covered with grids to admit the water from the surface, the channels being inclined to direct water in the channels to a network of collection pipes leading to an outlet.

[0004] In the particular example of paved areas to be used by motor vehicles, it is necessary to provide a pollutant trap to remove contamination from the water passed to the outlet. 30% of pollutants in river water are believed to be from run-off from such impermeable surfaces. Generally, the pollutant trap is located at an "end of pipe" position in the drainage system to receive the collected water and to perform the pollutant trapping step just prior to discharge of the water from the outlet. Generally, such pollutant traps have a settling part, to enable suspended particles to settle, and also have a trap to prevent surface pollutants such as oil and petrol from reaching the outlet. As the pollutant trap physically traps and stores contaminants, it must be accessed to remove the trapped pollutants at appropriate intervals. It is also known to provide gully pots as part of a drainage system to trap debris before the water passes into the drainage system.

[0005] Such systems are unsatisfactory for a number of reasons. Pollutant traps are usually located underground, as there must be a drop in the drainage system to direct water to the pollutant trap. This leads to consequent difficulties with maintenance and cleaning of the trap. The pollutant trap must be sufficiently large to cope with run-off from the extent of the paved area, with a corresponding difficulty and expense in providing and installing the pollutant trap. Further, in practice such traps may fail to perform their function adequately. For example in circumstances where there is a high flow rate of liquid, such as a result of a heavy rainfall. In high flow situations, it is necessary to slow the water in order for the settling part to operate. This can induce turbulence in the water which can in turn cause any oil or similar pollutant carried by the water to emulsify such that the oil is suspended in the water and passes through the oil/petrol trap to the outlet. Gully pots provide no control over flow rates or liquid velocity, and cannot receive sheet flow.

[0006] The aim of the present invention is to reduce or overcome one or more of the above problems.

[0007] According to a first aspect of the invention there is provided a drainage element as defined in claim 1.

[0008] Each liquid holding part may comprise a generally channel shaped element having a base part, a pair of opposed side walls and a pair of transverse walls extending between the side walls.

5 **[0009]** Each liquid holding part is preferably substantially horizontal in use, to decrease flow of liquid along the liquid holding part.

[0010] Each liquid holding part and each liquid inlet may comprise an elongate configuration to enable receipt of sheet flow of liquid.

10 **[0011]** The elongate liquid inlet of each elongate liquid holding part may comprise openings disposed over a substantial part of the liquid holding part.

[0012] The drainage element may further comprise an upper part received on top of each liquid holding part, and the liquid inlet of each liquid holding part may be provided by the upper part.

[0013] The upper part may comprise a kerb part. The upper part may comprise a grid.

20 **[0014]** Each liquid outlet may comprise an inner mouth and means to maintain a liquid level above the inner mouth, the outlet being arranged to restrict the flow of liquid from the liquid holding part.

[0015] The means to maintain a liquid level above the inner mouth may comprise an outer mouth disposed above the inner mouth and a passage extending between the inner mouth and the outer mouth.

[0016] The outlet acts as a baffle-and-weir arrangement whereby there is little or no liquid flow in each liquid holding part, so that suspended contaminants can settle, whilst the location of the inner mouth below the outer mouth means that, providing the water level does not fall below the top of the inner mouth, floating pollutants are retained within each liquid holding part and cannot pass to the outer mouth.

35 **[0017]** According to a second aspect of the invention there is provided a drainage system comprising a plurality of drainage elements according to the first aspect of the invention.

40 **[0018]** The drainage elements may be arranged in an end-to-end configuration, to form a line.

[0019] The drainage elements may be arranged substantially horizontally, to decrease flow of liquid along each liquid holding part of each drainage element.

45 **[0020]** Each liquid holding part and each liquid inlet of each drainage element may comprise an elongate configuration to enable receipt of sheet flow of liquid.

[0021] The arrangement of the line of drainage elements may enable receipt of sheet flow of liquid in a direction substantially transverse to the line of drainage elements.

[0022] Each elongate liquid inlet of each elongate liquid holding part may comprise openings disposed over a substantial part of the liquid holding part.

55 **[0023]** Each drainage element may comprise an upper part received on top of each liquid holding part thereof, the liquid inlet of each liquid holding part being provided by the upper part.

[0024] The upper part of each drainage element may be disposed substantially at ground level.

[0025] The upper part of at least one of the drainage elements may comprise a kerb part. The upper part of at least one of the drainage elements may comprise a grid.

[0026] Each liquid holding part of each drainage element may be disposed below ground level.

[0027] Each liquid holding part may comprise a generally channel shaped element having a base part, a pair of opposed side walls and a pair of transverse walls extending between the side walls.

[0028] Each liquid outlet may comprise an inner mouth and means to maintain a liquid level above the inner mouth, the outlet being arranged to restrict the flow of liquid from each liquid holding part.

[0029] The means to maintain a liquid level above the inner mouth may comprise an outer mouth disposed above the inner mouth and a passage extending between the inner mouth and the outer mouth.

[0030] The drainage system may comprise a receiving means to receive liquid from the liquid outlet of at least one of the drainage elements.

[0031] The drainage system may comprise an impermeable surface, the impermeable surface being inclined to direct liquid towards the drainage element.

[0032] The invention will now be described by way of example only with reference to the accompanying drawings, wherein:

Figure 1 is a perspective view of a first embodiment of a drainage element according to the invention,
Figure 2 is a cross-sectional view of the drainage element of Figure 1 where installed as part of a drainage system,

Figure 3 is a cross-sectional view through a further drainage system including the drainage element of Figure 1,

Figure 4 is a diagrammatic plan view of part of a drainage system according to the invention,

Figure 5 is a perspective view of a second embodiment of a drainage element according to the invention, and

Figure 6 is a partial cross sectional view of the drainage element of Figure 5.

[0033] Referring now to Figures 1 to 3, a drainage element is shown at 10. The drainage element 10 comprises two liquid holding parts 11, each having a liquid inlet and a liquid outlet generally indicated at 12. In this example, the drainage element 10 is generally elongate and channel shaped, such that each liquid holding part has a base part 13, a pair of opposed side walls 14, 15, and as best seen in Figure 1 two transverse walls 16 extending between the side walls 14, 15, the middle transverse wall 16 being shared by the liquid holding parts 11.

[0034] As seen in Figures 1 to 3, the upper parts of the drainage element 10 are provided with formations 23 to

receive an upper part over the base part 13. In this example, the formation 23 comprises a return in the upper part of the side walls 14, 15 and the end transverse walls 16. In Figure 2, the upper part comprises a grid, generally shown at 24, which engages the formations 23. The grid 24 in connection manner has a series of slots 25 to provide the liquid inlet for each liquid holding part 11, which permits water to run into the drainage element 10 and also to support pedestrians or vehicles which pass over the drainage element 10. In use, the drainage element 10 is disposed such that the upper ends of the side walls 14, 15 are generally at ground level, indicated at 26, and the ground level is graded appropriately to direct run off water or other liquid into the drainage element 10.

[0035] In the embodiment of Figure 3 an upper part comprising a kerb 27 is shown, which is provided at its lower end with formations 28 to engage the formations 23. Here the upper part is shaped like a kerb stone with an inclined side face 29 and a top surface 30. In this example, a paved surface such as a road way is shown at 31 and a paved surface such as a footpath is shown having a different level at 32. The upper part 27 has at least one and preferably a plurality of openings 25 to provide the liquid inlet for each liquid holding part 11, which admit liquid into the drainage element 10. It will be apparent that an upper part may be provided with any appropriate configuration as desired.

[0036] As best seen in Figure 2, the liquid outlet 12 of each liquid holding part comprises an inner mouth 17 opening on an inner face 15a of the side wall 15, and means to maintain the level of liquid in each liquid holding part 11 above the inner mouth 17. In the present example, the means to maintain the level of liquid in each liquid holding part 11 comprises an outer mouth 18 opening on an outer face 15b of the side wall 15 and a passage 19 extending between the inner mouth 17 and the outer mouth 18. The outer mouth 18 is disposed above the inner mouth 17 such that, in the present example, the passage 19 extends generally vertically within the side wall 15 to connect the inner mouth 17 and outer mouth 18. The inner mouth 17 is disposed towards the bottom of the side wall 15, but is spaced from the level of the base part 13. The liquid outlets 12 may be described as a weir and baffle arrangement, in that the limb 20 alongside the passage 19 and below the mouth 18 forms a weir over which liquid can flow when it reaches a sufficient level, whilst the limb 21 forming part of the side wall 15 extending vertically from the inner mouth 17 and alongside the passage 19 forms a baffle so that any liquid flow over the weir 20, that is out of the outer mouth 18, must pass through the inner mouth 17.

[0037] The liquid outlets 12 are arranged to reduce the flow of liquid from each liquid holding part 11 and minimise the flow velocity of liquid within each liquid holding part 11. In the present example the liquid holding part has a capacity of 15 litres per linear meter and the passage 19 has an open surface area of 1400 mm². The maximum outflow of liquid from the liquid holding part is

thus restricted to approximately 1.6 l/s (irrespective of the rate of flow of liquid into the liquid holding part), thus providing a buffer in circumstances of heavy or sudden rainfall, for example. It will be apparent that the maximum rate of flow from each liquid holding part 11 may be varied by changing the dimensions and/or number of outlets 12. The rate of outflow may be selected, for example, to take into account the maximum inflow which the element 10 is expected to receive, for example during a storm and the corresponding rate at which storm water should be released taking into account the storage capacity of the element 10 whilst limiting the outflow rate to avoid entrainment of contaminants.

[0038] In this embodiment, to reduce the flow of liquid within each liquid holding part 11, each liquid outlet 12 is located in one of the elongate opposed side walls 15. Liquid will thus flow out of the liquid holding part 11 without having to travel a large distance within the liquid holding part 11 and thus limiting any acceleration in the rate of movement of liquid within each liquid holding part 11.

[0039] Other means to maintain the level of liquid in each liquid holding part 11 above the inner mouth 17 may be envisaged as desired, for example an upwardly-directed pipe or a chamber with a constant-level control to maintain the desired liquid level, but the embodiment shown in the drawings is advantageous in that it is relatively simple and compact.

[0040] The drainage element 10 may be made out of any appropriate material as desired. For example, the drainage element 10 may be made out of a suitable robust, impermeable material such as a plastic material. Alternatively, the drainage element may be made of some suitable permeable material such as casting concrete, and provided with a impermeable lining. Each liquid outlet may be provided integrally as part of the drainage element 10, for example moulded as part of a plastics manufacturing process, or may be provided separately. For example, it may be envisaged that where each liquid holding part 11 is made of a permeable material, a suitable aperture is left in a side wall of the liquid holding part 11 and a liner having a formation to provide the outlet is located within the liquid holding part aperture. It might even be envisaged that a drainage element 10 may be provided in situ, for example by forming a liquid holding part 11 from concrete on site and then inserting a liner.

[0041] In use, for example when used as part of a drainage system, the drainage element 10 is laid such that it is generally level and arranged to receive liquid from an appropriate surface 26, such as rainwater run-off. Water with contaminants is received in the liquid holding part 11. As the drainage element 10 is laid in a generally horizontal orientation and as each liquid holding part 11 is separate and each drainage element 10 is separate from other drainage elements, the water held in each liquid holding part 11 does not substantially flow. Each liquid holding part 11 acts as a settling tank such that particulate contaminants, here generally shown at 21, settle on the base part 13 of the liquid holding part 11, but below the

level of the inner mouth 17 to avoid the inner mouth 17 being blocked. Floating contaminants such as oil, here generally shown at 22, float on the surface of the water in each liquid holding part 11, but due to the arrangement of the each liquid outlet 12, in particular the baffle 21, will not be able to pass through the passage 12 and over the weir 20. It will be apparent however, that when water in each liquid holding part 11 rises above a certain level, the level of water in the passage 12 will also rise and will rise sufficiently such that liquid passes out of the outer mouth 18. The water flowing out of the outer mouth 18 will have had particulate contamination and oil removed from it and thus may be disposed of as desired without necessarily requiring further treatment. Each liquid outlet is thus oil-protected. The water may thus be disposed of as desired, for example into a pipe or conduit leading to a main drain, or may be directed to a soak away, or may be directed to an appropriate sub-base system such as that disclosed in International Patent Application No. WO 02/14608.

[0042] To provide for treatment of floating contaminants, a buoyant element (not shown) may be provided within each liquid holding part 11 to absorb and/or assist in breaking down contaminants. The buoyant element in the present example comprises a mat of fibrous material, for example a random mat, a woven material or a pile type fabric. The fabric may be an appropriate geotextile of generally conventional type. The fabric may have an affinity to oil, such that oil is absorbed by or at least held within the buoyant element. The buoyant element also advantageously may be suitable to provide a surface on which a biofilm may form. A biofilm consists of microbial cells, in particular bacteria, and an extracellular biopolymer produced by the cells. The biofilm provides a favourable environment for the cells which form the biofilm.

[0043] Figure 4 is a diagrammatic illustration of a drainage system comprising a plurality of such drainage elements 10. In this example, a paved surface having a generally impermeable surface is shown at 40, for example in this case a car park. The impermeable surface 40 is inclined with a suitable slope generally indicated by arrows A such that run-off liquid, such as water, flows towards a row of drainage elements 10, in this example each provided with a grid 24. Advantageously, the elongate configuration of each drainage element 10 allows the drainage element to receive sheet flow of water without requiring that the water be funnelled with a consequent increase in flow velocity. To receive liquid from each of the outer mouths 18 of each drainage element 10, a receiving means is shown at 41, in this case a conduit or pipe to receive water and direct it to an outlet as shown by arrow B. As mentioned above, the receiving means may alternatively be a simple soak away system, or a sub-base holding system or any other receiving means as desired. The run off from the impermeable surface 40, including oil and particulate contamination, is received in the drainage elements 10 where the oil and particulate contamination is held within each drainage

element 10 and water passed out through the receiving means 41. To maintain the drainage system, it is simply necessary to remove the accumulated particulate contamination and oil at intervals. Further, since each drainage element 10 is accessible from the surface, such maintenance, cleaning and inspection is very much simpler.

[0044] Each drainage element 10 may be of an appropriate size as desired, but it might envisage that each drainage element is elongate, on the order of a meter long, or two meters long, and any number may be provided and required.

[0045] The advantages of the drainage system are substantial. The flow of liquid out of each drainage element 10 can be controlled by varying the size and number of the liquid outlets 12, thus providing a passive flow control system to, for example, limit the maximum flow of water which is passed to the mains drainage and thus buffering the effects of, for example, heavy rainfall. Ease of maintenance and inspection have been referred to above and the reduced amount of excavation needed to provide a drainage system on a site is reduced by removing the need to install an underground structure.

[0046] Further, each drainage element 10 provides an at-source control of pollutants in that liquid is received first in each liquid holding part 11 and is treated close to the surface by the first element of the drainage system. If necessary the drainage system may comprise a treatment train of which each drainage element is the first stage. Outflow liquid could then be passed to other elements for further treatment such as a sand filter or a holding structure such as that described in our co-pending application no. GB 0305944.1.

[0047] The provision of a plurality of separate liquid holding parts 11 provides an inherent capacity to isolate spillages. Installation is simplified compared to conventional systems since there is no need to provide a consistent fall in the drainage system to direct fluid to a underground structure and each individual element 10 is laid in a generally level configuration. As each liquid holding part is distinct and water tight, and there are no joints between elements 10 which might be a source of leakage, the retention of trapped contaminants is improved.

[0048] Figures 5 and 6 show a second embodiment of a drainage element 42. The drainage element comprises a liquid holding part 43, having a liquid inlet and a liquid outlet generally indicated at 44. As before, the drainage element 42 is generally elongate and channel shaped, and the liquid holding part has a base part 46, a pair of opposed side walls 48, and two transverse walls 50 extending between the side walls 48 (only one of which is shown in Figure 5).

[0049] The upper part of the drainage element 42 are not shown, for the sake of clarity, but as before, may comprise a grid or a kerb. The upper part preferably provides a series of slots to provide the liquid inlet for the liquid holding part 43, which permits liquid to run into the drainage element 42. It will be apparent that an upper

part may be provided with any appropriate configuration as desired.

[0050] The transverse wall 50 comprises two parts 52 defining an aperture 54 therebetween. Each part 52 is provided at an inner end thereof, on either side of the aperture 54, with a wall 56 which extends substantially perpendicular to and rearwardly of the part 52. Each wall 56 extends from the base portion 46 of the drainage element to approximately three quarters of the height of the parts 52, i.e. an aperture 58 is provided above each wall 56, as shown. The walls 56 abut a baffle 60, at an angle of substantially 90 degrees. The baffle 60 is fixed to the base portion 46 of the drainage element, in an arrangement which is substantially parallel to the parts 52 of the transverse wall 50. The baffle 60 is provided with two apertures 62, at a base portion thereof. The two apertures 62 comprise an inner mouth, and each opens into a passageway defined by the baffle 60, a wall 56, a part 52 of the transverse wall 50, and a side wall 48, as shown. Each passageway terminates in one of the apertures 58 which comprise an outer mouth. The apertures 58 of the outer mouth are disposed above the apertures 62 of the inner mouth. The liquid outlet 44 may be described as a weir and baffle arrangement, in that the walls 56 form a weir over which liquid can flow when it reaches a sufficient level, whilst the baffle 60 acts as a baffle so that any liquid flow over the weir, that is out of the outer mouth, must pass through the inner mouth.

[0051] The liquid outlet 44 is arranged to reduce the flow of liquid from the liquid holding part 43 and minimise the flow velocity of liquid within the liquid holding part.

[0052] The drainage element 42 is used as part of a drainage system. This comprises a plurality of drainage elements 42, arranged in an end-to-end-configuration to form a line. Adjacent drainage elements are preferably tied together using ties 64 which mesh in tie slots 66 provided in each element. Each drainage element 42 is laid such that it is generally level and arranged to receive liquid from an appropriate surface, such as rainwater run-off. Water with contaminants, in a sheet flow, passes through the liquid inlet of each drainage element 42, and is received in the liquid holding part 43 of the drainage element. As each drainage element 42 is laid in a generally horizontal orientation and as each liquid holding part 43 forms an enclosure accessed by the liquid inlet and liquid outlet only, each drainage element 10 therefore being separate from other drainage elements, the water held in the liquid holding part 43 of each drainage element does not substantially flow. Each liquid holding part 43 acts as a settling tank such that particulate contaminants, settle on the base part of the liquid holding part. Floating contaminants such as oil, float on the surface of the water in each liquid holding part 43, but due to the arrangement of the each liquid outlet 44, in particular the baffle 60, will not be able to pass through the passageways, over the weir and out of the outer mouth. It will be apparent however, that when water in the liquid holding part 43 of each drainage element 42 rises above a certain level, the level

of water in the passageways will also rise and will rise sufficiently such that water passes out of the outer mouth. The water flowing out of the outer mouth will have had particulate contamination and oil removed from it and thus may be disposed of as desired without necessarily requiring further treatment. Each liquid outlet is thus oil-protected. The water may thus be disposed of as desired, for example into a pipe or conduit leading to a main drain, or may be directed to a soak away, or may be directed to an appropriate sub-base system such as that disclosed in International Patent Application No. WO 02/14608. In this embodiment, the water may flow along a conduit formed between two adjacent drainage elements, provided by semi circular recesses 68 in each drainage element.

[0053] The advantages of such a drainage system are the same as those discussed above with respect to the drainage system comprising a plurality of drainage elements according to the first embodiment thereof.

[0054] In the present specification "comprise" means "includes or consists of" and "comprising" means "including or consisting of".

Claims

1. A drainage element (10) comprising a plurality of liquid holding parts (11), each liquid holding part (11) comprising a liquid inlet and a liquid outlet (12), **characterised in that** liquid is constrained to enter each liquid holding part of the drainage element via the respective liquid inlets, and is constrained to exit each liquid holding part of the drainage element via the respective liquid outlets, and liquid is prevented from flowing from one liquid holding part (11) to any other liquid holding part (11), and wherein, in use, the drainage element (10) is positionable adjacent at least one further such drainage element (10), and liquid is prevented by the liquid holding part (11) from flowing from the drainage element (10) to the at least one further drainage element (10), the drainage element (10) being further **characterised in that** each liquid outlet (12) comprises a baffle-and-weir configuration such that sediments are retained in each liquid holding part (11) and floating contaminants are retained in each liquid holding part (11) by the baffle.
2. A drainage element (10) according to claim 1 wherein each liquid holding part (11) comprises a generally channel shaped element having a base part (13), a pair of opposed side walls (14, 15) and a pair of transverse walls (16) extending between the side walls (14, 15).
3. A drainage element (10) according to claim 1 or claim 2 wherein each liquid holding part (11) is substantially horizontal in use, to decrease flow of liquid

along the liquid holding part (11).

4. A drainage element (10) according to any one of the preceding claims wherein each liquid holding part (11) and each liquid inlet comprises an elongate configuration to enable receipt of sheet flow of liquid.
5. A drainage element (10) according to claim 4 wherein the elongate liquid inlet of each elongate liquid holding part (11) comprises openings (25) disposed over a substantial part of the liquid holding part (11).
6. A drainage element (10) according to any one of the preceding claims further comprising an upper part (27) received on top of each liquid holding part (11), and wherein the liquid inlet of each liquid holding part (11) is provided by the upper part (27).
7. A drainage element (10) according to claim 6 wherein the upper part (27) comprises a kerb part.
8. A drainage element (10) according to claim 6 or claim 7 wherein the upper part (27) comprises a grid (24).
9. A drainage element (10) according to any preceding claim wherein each liquid outlet (12) comprises an inner mouth (17) and means to maintain a liquid level above the inner mouth (17), the outlet (12) being arranged to restrict the flow of liquid from the liquid holding part (11).
10. A drainage element (10) according to claim 9 wherein the means to maintain a liquid level above the inner mouth (17) comprises an outer mouth (18) disposed above the inner mouth (17) and a passage (19) extending between the inner mouth (17) and the outer mouth (18).
11. A drainage system comprising a plurality of drainage elements (10) according to any one of the preceding claims.
12. A drainage system according to claim 1 wherein the drainage elements (10) are arranged in an end-to-end configuration, to form a line.
13. A drainage system according to claim 11 or claim 12 wherein the drainage elements (10) are arranged substantially horizontally, to decrease flow of liquid along each liquid holding part (11) of each drainage element (10).
14. A drainage system according to any of claims 11 to 13 wherein each liquid holding part (11) and each liquid inlet of each drainage element (10) comprises an elongate configuration to enable receipt of sheet flow of liquid.

15. A drainage system according to claim 14 as dependent from claim 12 wherein the arrangement of the line of drainage elements (10) enables receipt of sheet flow of liquid in a direction substantially transverse to the line of drainage elements (10).
16. A drainage system according to claim 14 or claim 15 wherein each elongate liquid inlet of each elongate liquid holding part (11) comprises openings (25) disposed over a substantial part of the liquid holding part (11).
17. A drainage system according to any of claims 11 to 16 wherein each drainage element (10) comprises an upper part (27) received on top of each liquid holding part (11) thereof, the liquid inlet of each liquid holding part (11) being provided by the upper part (27).
18. A drainage system according to claim 17 wherein the upper part (27) of each drainage element (10) is disposed substantially at ground level.
19. A drainage system according to claim 17 or claim 18 wherein the upper part (27) of at least one of the drainage elements (10) comprises a kerb part.
20. A drainage system according to any of claims 17 to 19 wherein the upper part (27) of at least one of the drainage elements (10) comprises a grid (24).
21. A drainage system according to any of claims 11 to 20 wherein each liquid holding part (11) of each drainage element (10) is disposed below ground level.
22. A drainage system according to any one of claims 11 to 21 wherein each liquid holding part (11) comprises a generally channel shaped element having a base part (13), a pair of opposed side walls (14, 15) and a pair of transverse walls (16) extending between the side walls (14, 15).
23. A drainage system according to any of claims 11 to 22 wherein each liquid outlet (12) comprises an inner mouth (17) and means to maintain a liquid level above the inner mouth (17), the outlet (12) being arranged to restrict the flow of liquid from each liquid holding part (11).
24. A drainage system according to claim 23 wherein the means to maintain a liquid level above the inner mouth (17) comprises an outer mouth (18) disposed above the inner mouth (17) and a passage (19) extending between the inner mouth (17) and the outer mouth (18).
25. A drainage system according to any of claims 11 to

24 comprising a receiving means (41) to receive liquid from the liquid outlet (12) of at least one of the drainage elements (10).

26. A drainage system according to any of claims 11 to 25 comprising an impermeable surface, the impermeable surface being inclined to direct liquid towards the drainage element.

Patentansprüche

1. Oberflächenablaufelement (10) mit mehreren Flüssigkeitshalteteilen (11), wobei jedes Flüssigkeitshalteteil (11) einen Flüssigkeitseinlass und einen Flüssigkeitsauslass (12) umfasst, **dadurch gekennzeichnet, dass** Flüssigkeit gezwungen wird, in jedes Flüssigkeitshalteteil des Oberflächenablaufelements über die jeweiligen Flüssigkeitseinlässe einzutreten, und gezwungen wird, aus jedem Flüssigkeitshalteteil des Oberflächenablaufelements über die jeweiligen Flüssigkeitsauslässe auszutreten, und dass verhindert wird, dass Flüssigkeit von einem Flüssigkeitshalteteil (11) zu irgendeinem anderen Flüssigkeitshalteteil (11) fließt, und wobei im Gebrauch das Oberflächenablaufelement (10) neben zumindest einem weiteren solchen Oberflächenablaufelement (10) positioniert werden kann, und dass Flüssigkeit durch das Flüssigkeitshalteteil (11) daran gehindert wird, von dem Oberflächenablaufelement (10) zu dem zumindest einen weiteren Oberflächenablaufelement (10) zu fließen, wobei das Oberflächenablaufelement (10) weiterhin **dadurch gekennzeichnet ist, dass** jeder Flüssigkeitsauslass (12) eine Prallblech-und-Wehr-Konfiguration umfasst, so dass Sedimente in jedem Flüssigkeitshalteteil (11) zurückgehalten werden und schwimmende Schmutzteilchen in jedem Flüssigkeitshalteteil (11) von dem Ablenkblech zurückgehalten werden.
2. Oberflächenablaufelement (10) nach Anspruch 1, wobei jedes Flüssigkeitshalteteil (11) ein im Allgemeinen kanalförmiges Element umfasst, das ein Basisteil (13), ein Paar gegenüberliegende Seitenwände (14, 15) und ein Paar Querwände (16) aufweist, die sich zwischen den Seitenwänden erstrecken (14, 15).
3. Oberflächenablaufelement (10) nach Anspruch 1 oder Anspruch 2, wobei jedes Flüssigkeitshalteteil (11) im Gebrauch im Wesentlichen horizontal ist, um das Strömen von Flüssigkeit entlang des Flüssigkeitshalteteils (11) zu verringern.
4. Oberflächenablaufelement (10) nach irgendeinem der vorhergehenden Ansprüche, wobei jedes Flüssigkeitshalteteil (11) und jeder Flüssigkeitseinlass eine längliche Konfiguration umfasst, um die Auf-

nahme eines großflächigen Stroms von Flüssigkeit zu ermöglichen.

5. Oberflächenablaufelement (10) nach Anspruch 4, wobei der längliche Flüssigkeitseinlass jedes länglichen Flüssigkeitshalteteils (11) Öffnungen (25) umfasst, die über einem wesentlichen Teil des Flüssigkeitshalteteils (11) angeordnet sind. 5
6. Oberflächenablaufelement (10) nach irgendeinem der vorhergehenden Ansprüche, weiterhin mit einem oberen Teil (27), das oben auf jedem Flüssigkeitshalteteil (11) aufgenommen ist, und wobei der Flüssigkeitseinlass jedes Flüssigkeitshalteteils (11) von dem oberen Teil (27) bereitgestellt wird. 10
7. Oberflächenablaufelement (10) nach Anspruch 6, wobei das obere Teil (27) ein Kastenteil umfasst. 15
8. Oberflächenablaufelement (10) nach Anspruch 6 oder Anspruch 7, wobei das obere Teil (27) ein Gitter (24) umfasst. 20
9. Oberflächenablaufelement (10) nach irgendeinem vorhergehenden Anspruch, wobei jeder Flüssigkeitsauslass (12) eine innere Mündung (17) und ein Mittel zum Aufrechterhalten eines Flüssigkeitspegels über der inneren Mündung (17) umfasst, wobei der Auslass (12) dazu angeordnet ist, das Strömen der Flüssigkeit von dem Flüssigkeitshalteteil (11) zu begrenzen. 25
10. Oberflächenablaufelement (10) nach Anspruch 9, wobei das Mittel zum Aufrechterhalten eines Flüssigkeitspegels über der inneren Mündung (17) eine äußere Mündung (18), die über der inneren Mündung (17) angeordnet ist, und einen Durchgang (19) umfasst, der sich zwischen der inneren Mündung (17) und der äußeren Mündung (18) erstreckt. 30
11. Oberflächenablaufsystem mit mehreren Oberflächenablaufelementen (10) nach irgendeinem der vorhergehenden Ansprüche. 35
12. Oberflächenablaufsystem nach Anspruch 11, wobei die Oberflächenablaufelemente (10) in einer durchgehenden Konfiguration angeordnet sind, um eine Linie zu bilden. 40
13. Oberflächenablaufsystem nach Anspruch 11 oder Anspruch 12, wobei die Oberflächenablaufelemente (10) im Wesentlichen horizontal angeordnet sind, um das Strömen von Flüssigkeit entlang jedes Flüssigkeitshalteteils (11) jedes Oberflächenablaufelements (10) zu verringern. 45
14. Oberflächenablaufsystem nach irgendeinem der Ansprüche 11 bis 13, wobei jedes Flüssigkeitshalte- 50

teil (11) und jeder Flüssigkeitseinlass jedes Oberflächenablaufelements (10) eine längliche Konfiguration umfasst, um die Aufnahme eines großflächigen Stroms von Flüssigkeit zu ermöglichen.

15. Oberflächenablaufsystem nach Anspruch 14 bei Abhängigkeit von Anspruch 12, wobei die Anordnung der Linie von Oberflächenablaufelementen (10) die Aufnahme eines großflächigen Stroms von Flüssigkeit in einer Richtung ermöglicht, die im Wesentlichen quer zur Linie der Oberflächenablaufelemente (10) ist. 5
16. Oberflächenablaufsystem nach Anspruch 14 oder Anspruch 15, wobei der längliche Flüssigkeitseinlass jedes länglichen Flüssigkeitshalteteils (11) Öffnungen (25) umfasst, die über einem wesentlichen Teil des Flüssigkeitshalteteils (11) angeordnet sind. 10
17. Oberflächenablaufsystem nach irgendeinem der Ansprüche 11 bis 16, wobei jedes Oberflächenablaufelement (10) ein oberes Teil (27), das oben auf jedem Flüssigkeitshalteteil (11) davon aufgenommen ist, umfasst, wobei der Flüssigkeitseinlass jedes Flüssigkeitshalteteils (11) von dem oberen Teil (27) vorgesehen wird. 15
18. Oberflächenablaufsystem nach Anspruch 17, wobei das obere Teil (27) jedes Oberflächenablaufelements (10) im Wesentlichen auf Bogenhöhe angeordnet ist. 20
19. Oberflächenablaufsystem nach Anspruch 17 oder Anspruch 18, wobei das obere Teil (27) von zumindest einem der Oberflächenablaufelemente (10) ein Kantenteil umfasst. 25
20. Oberflächenablaufsystem nach irgendeinem der Ansprüche 17 bis 19, wobei das obere Teil (27) von zumindest einem der Oberflächenablaufelemente (10) ein Gitter (24) umfasst. 30
21. Oberflächenablaufsystem nach irgendeinem der Ansprüche 11 bis 20, wobei jedes Flüssigkeitshalteteil (11) jedes Oberflächenablaufelements (10) unter Bodenhöhe angeordnet ist. 35
22. Oberflächenablaufsystem nach irgendeinem der Ansprüche 11 bis 21, wobei jedes Flüssigkeitshalteteil (11) ein im Wesentlichen kanalförmiges Element mit einem Basisteil (13), ein Paar gegenüberliegende Seitenwände (14,15) und ein Paar Querwände (16) umfasst, die sich zwischen den Seitenwänden (14, 15) erstrecken. 40
23. Oberflächenablaufsystem nach irgendeinem der Ansprüche 11 bis 22, wobei jeder Flüssigkeitsauslass (12) eine innere Mündung (17) und ein Mittel 45

umfasst, um einen Flüssigkeitspegel über der inneren Mündung (17) aufrechtzuerhalten, wobei der Auslass (12) dazu angeordnet ist, das Strömen von Flüssigkeit von dem jeweiligen Halteteil (11) zu begrenzen.

24. Oberflächenablaufsystem nach Anspruch 23, wobei das Mittel zum Aufrechterhalten eines Flüssigkeitspegels über der inneren Mündung (17) eine äußere Mündung (18), die über der inneren Mündung (17) angeordnet ist, und einen Durchgang (19) umfasst, der sich zwischen der inneren Mündung (17) und der äußeren Mündung (18) erstreckt.
25. Oberflächenablaufsystem nach irgendeinem der Ansprüche 11 bis 24, mit einem Aufnahmemittel (41) zum Aufnehmen von Flüssigkeit von dem Flüssigkeitsauslass (12) von zumindest einem der Oberflächenablaufelemente (10).
26. Oberflächenablaufsystem nach irgendeinem der Ansprüche 11 bis 25, mit einer undurchlässigen Oberfläche, wobei die undurchlässige Oberfläche geneigt ist, um Flüssigkeit in Richtung des Oberflächenablaufelements zu leiten.

Revendications

1. Un élément de drainage (10) comprenant plusieurs dispositifs de retenue de liquide (11), chaque dispositif de retenue de liquide (11) comprenant une admission de liquide et une sortie de liquide (12), **se caractérisant par le fait que** le liquide est contraint d'entrer dans chaque dispositif de retenue de liquide de l'élément de drainage par les admissions de liquide respectives et est contraint de sortir de chaque dispositif de retenue de liquide de l'élément de drainage par les sorties de liquide respectives et **par le fait que** le liquide ne peut pas passer d'un dispositif de retenue de liquide (11) à un autre dispositif de retenue de liquide (11) et **par le fait que**, en cours d'utilisation, l'élément de drainage (10) peut être positionné à côté d'au moins un autre élément de drainage (10) et que le dispositif de retenue de liquide (11) empêche le liquide d'aller de l'élément de drainage (10) à l'autre élément de drainage (10) ou à l'un des autres éléments de drainage (10), l'élément de drainage (10) se caractérisant également **par le fait que** chaque sortie de liquide (12) possède une configuration du type déflecteur-barrage permettant aux sédiments d'être conservés dans chaque dispositif de retenue de liquide (11) et aux contaminants flottants d'être conservés dans chaque dispositif de retenue de liquide (11) par le déflecteur.
2. Un élément de drainage (10) conformément à la revendication 1 dans lequel chaque dispositif de rete-

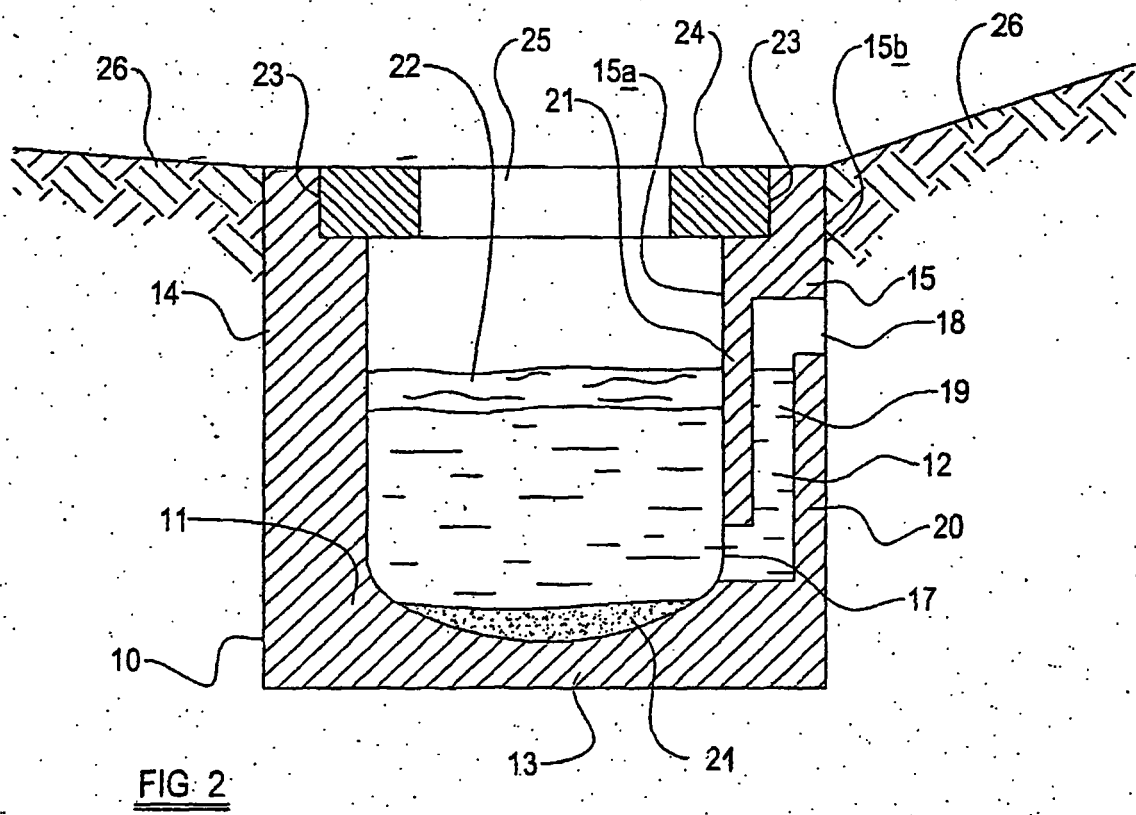
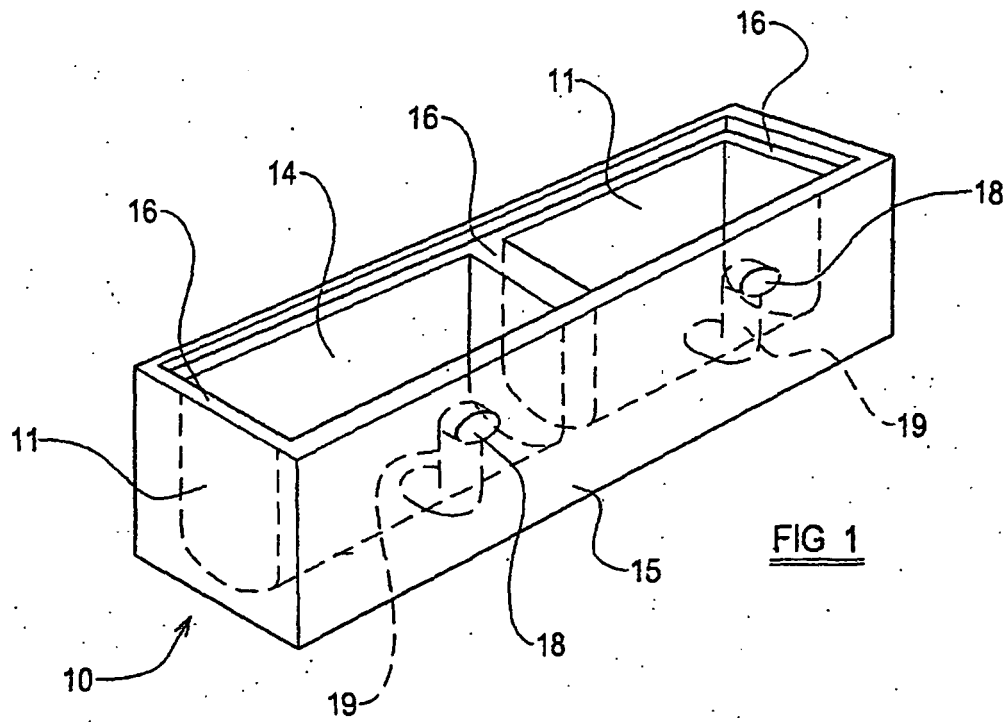
nue de liquide (11) possède d'une manière générale la forme d'un conduit, avec une base (13), une paire de parois latérales opposées (14, 15) et une paire de parois transversales (16) entre les parois latérales (14, 15).

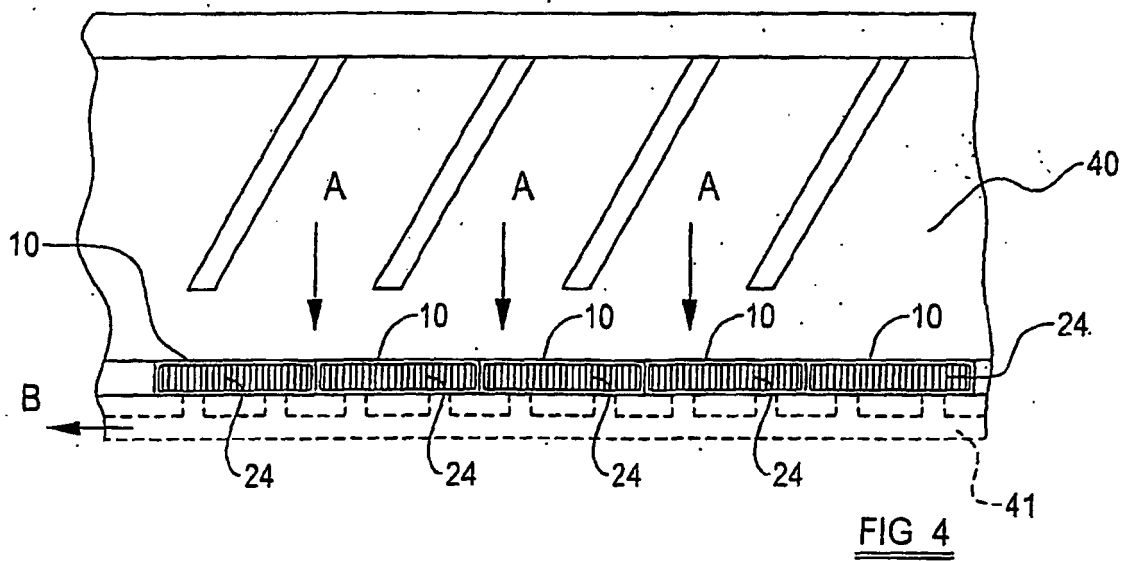
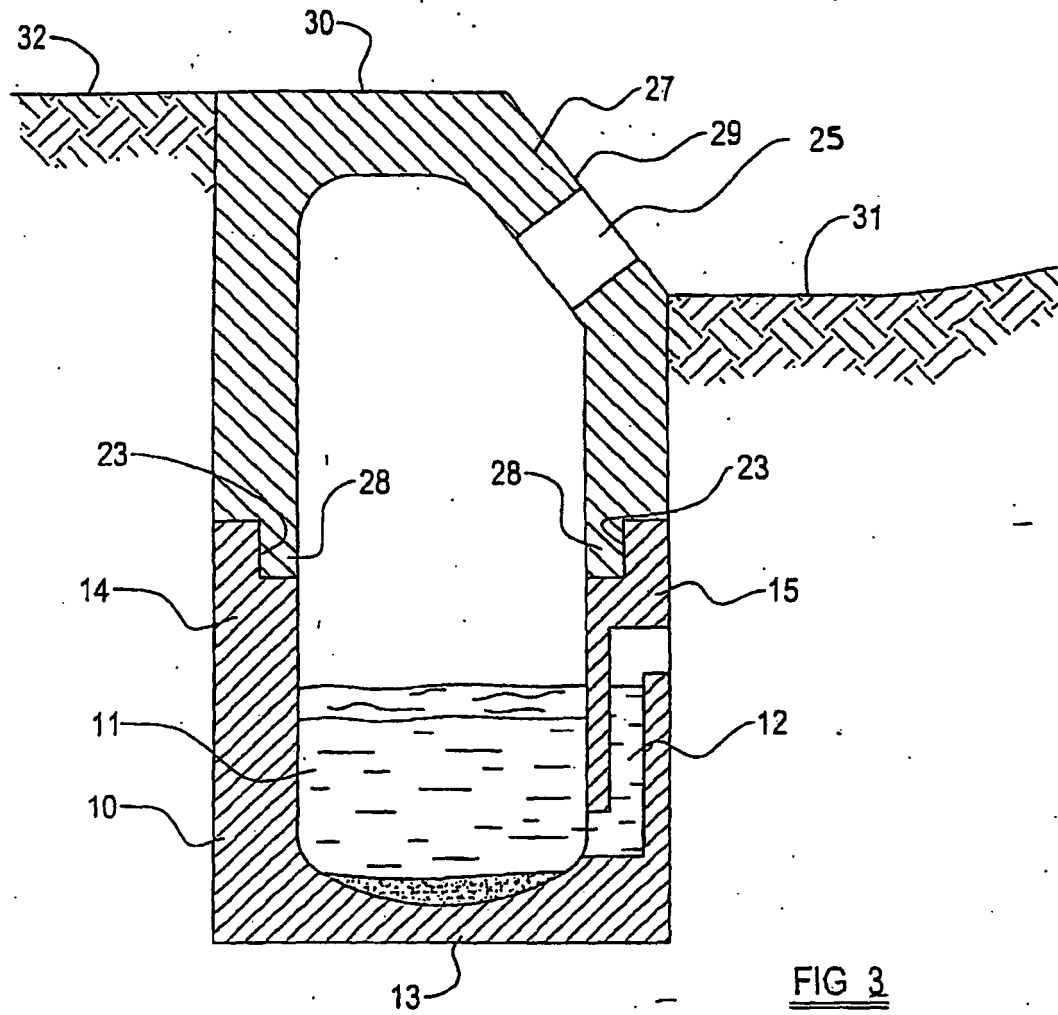
3. Un élément de drainage (10) conformément à la revendication 1 ou 2 dans lequel chaque dispositif de retenue de liquide (11) est sensiblement à l'horizontale pendant l'utilisation, afin de réduire le flux de liquide dans le dispositif de retenue de liquide (11).
4. Un élément de drainage (10) conformément à n'importe laquelle des revendications précédentes, dans lequel chaque dispositif de retenue de liquide (11) et chaque admission de liquide possèdent une forme allongée pour permettre la réception du ruissellement de liquide.
5. Un élément de drainage (10) conformément à la revendication 4 dans lequel l'admission de liquide allongée de chaque dispositif de retenue de liquide allongé (11) comporte des ouvertures (25) placées au-dessus d'une partie importante du dispositif de retenue de liquide (11).
6. Un élément de drainage (10) conformément à n'importe laquelle des revendications précédentes, comprenant également une partie supérieure (27) reçue au-dessus de chaque dispositif de retenue de liquide (11) et dans lequel l'admission de liquide de chaque dispositif de retenue de liquide (11) est fournie par la partie supérieure (27).
7. Un élément de drainage (10) conformément à la revendication 6 dans lequel la partie supérieure (27) comporte une bordure.
8. Un élément de drainage (10) conformément à la revendication 6 ou 7 dans lequel la partie supérieure (27) comporte une grille (24).
9. Un élément de drainage (10) conformément à n'importe laquelle des revendications précédentes dans lequel chaque sortie de liquide (12) comporte une bouche intérieure (17) et un dispositif permettant de maintenir un niveau de liquide au-dessus de la bouche intérieure (17), la sortie (12) étant configurée de manière à restreindre le flux de liquide provenant du dispositif de retenue de liquide (1.1).
10. Un élément de drainage (10) conformément à la revendication 9 dans lequel le dispositif permettant de maintenir un niveau de liquide au-dessus de la bouche intérieure (17) comporte une bouche extérieure (18) placée au-dessus de la bouche intérieure (17) et un passage (19) entre la bouche intérieure (17) et la bouche extérieure (18).

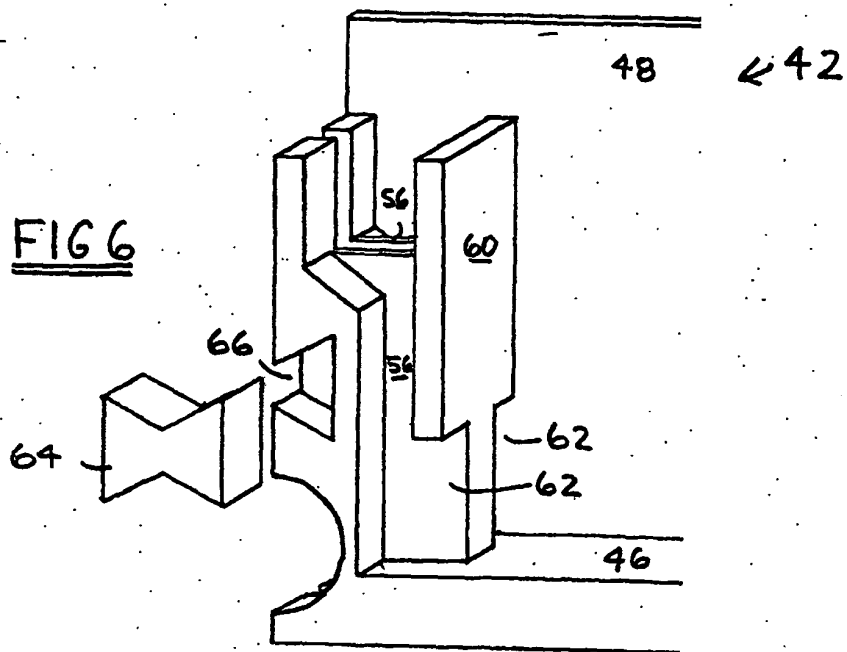
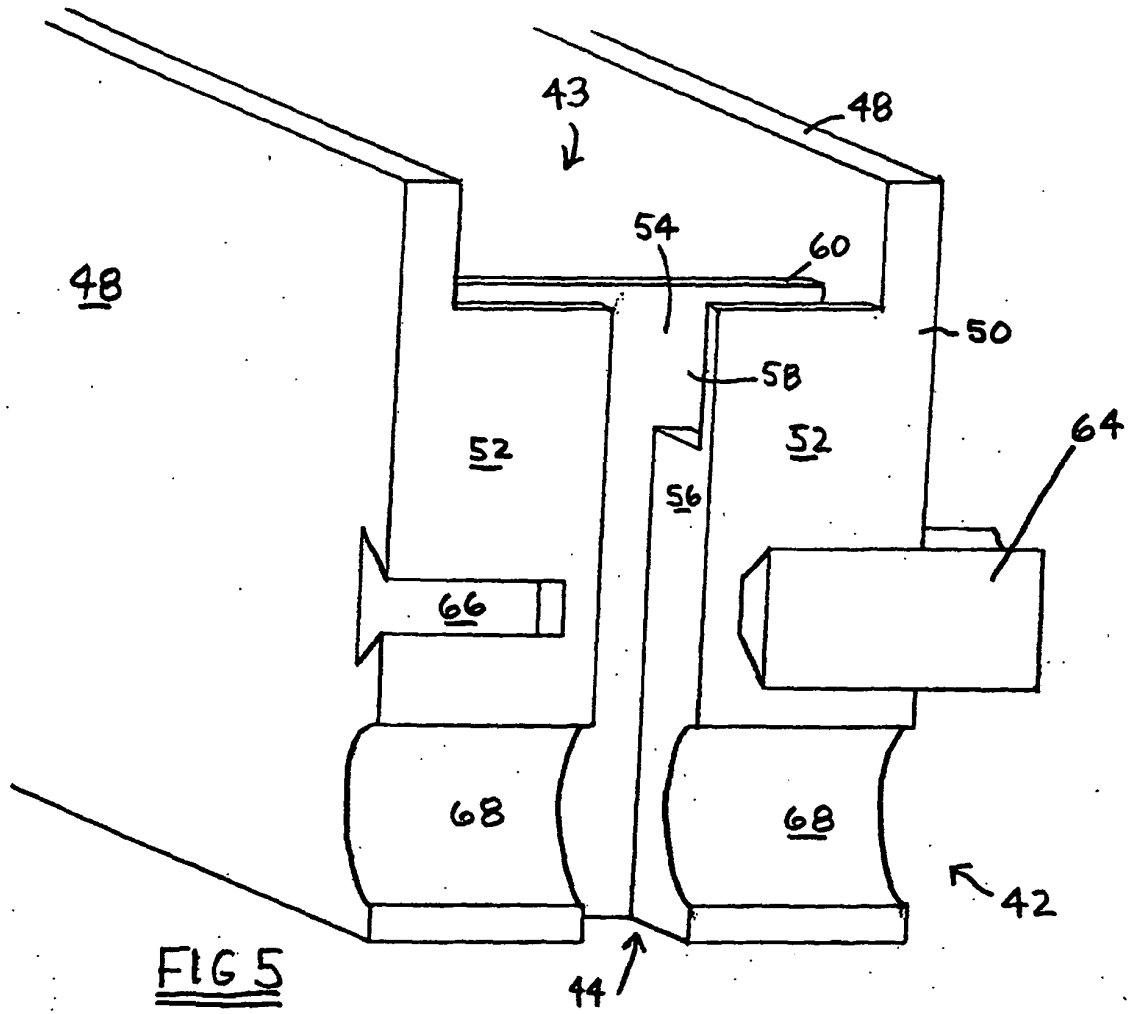
11. Un système de drainage composé de plusieurs éléments de drainage (10) conformément à n'importe laquelle des revendications précédentes.
12. Un système de drainage conformément à la revendication 11 dans lequel les éléments de drainage (10) sont disposés de bout en bout, de façon à former une ligne.
13. Un système de drainage conformément à la revendication 11 ou 12 dans lequel les éléments de drainage (10) sont disposés sensiblement à l'horizontale afin de réduire le flux de liquide dans chaque dispositif de retenue de liquide (11) de chaque élément de drainage (10).
14. Un système de drainage conformément à n'importe laquelle des revendications 11 à 13 dans lequel chaque dispositif de retenue de liquide (11) et chaque admission de liquide de chaque élément de drainage (10) possèdent une configuration allongée permettant de recevoir le ruissellement de liquide.
15. Un système de drainage conformément à la revendication 14, en fonction de la revendication 12, dans lequel la configuration de la ligne d'éléments de drainage (10) permet la réception du ruissellement de liquide dans un sens sensiblement transversal à la ligne d'éléments de drainage (10).
16. Un système de drainage conformément à la revendication 14 ou 15 dans lequel l'admission de liquide allongée de chaque dispositif de retenue de liquide allongé (11) comporte des ouvertures (25) disposées sur une partie importante du dispositif de retenue de liquide (11).
17. Un système de drainage conformément à n'importe laquelle des revendications 11 à 16 dans lequel chaque élément de drainage (10) comporte une partie supérieure (27) reçue au-dessus de chaque dispositif de retenue de liquide (11), l'admission de liquide de chaque dispositif de retenue de liquide (11) étant fournie par la partie supérieure (27).
18. Un système de drainage conformément à la revendication 17 dans lequel la partie supérieure (27) de chaque élément de drainage (10) se trouve sensiblement au niveau du sol.
19. Un système de drainage conformément à la revendication 17 ou 18 dans lequel la partie supérieure (27) d'au moins un des éléments de drainage (10) possède une bordure.
20. Un système de drainage conformément à n'importe laquelle des revendications 17 à 19 dans lequel la partie supérieure (27) d'au moins un des éléments

de drainage (10) comporte une grille (24).

21. Un système de drainage conformément à n'importe laquelle des revendications 11 à 20 dans lequel chaque dispositif de retenue de liquide (11) de chaque élément de drainage (10) se trouve au-dessous du niveau du sol.
22. Un système de drainage conformément à n'importe laquelle des revendications 11 à 21 dans lequel chaque dispositif de retenue de liquide (11) comprend un élément possédant d'une manière générale la forme d'un conduit, avec une base (13), une paire de parois latérales opposées (14,15) et une paire de parois transversales (16) entre les parois latérales (14,15).
23. Un système de drainage conformément à n'importe laquelle des revendications 11 à 22 dans lequel chaque sortie de liquide (12) comprend une bouche intérieure (17) et un dispositif permettant de maintenir un niveau de liquide au-dessus de la bouche intérieure (17), la sortie (12) étant configurée de façon à restreindre le flux de liquide provenant du dispositif de retenue respectif (11).
24. Un système de drainage conformément à la revendication 23 dans lequel le dispositif permettant de maintenir un niveau de liquide au-dessus de la bouche intérieure (17) comprend une bouche extérieure (18) située au-dessus de la bouche intérieure (17) et un passage (19) entre la bouche intérieure (17) et la bouche extérieure (18).
25. Un système de drainage conformément à n'importe laquelle des revendications 11 à 24 comprenant un dispositif de réception (41) pour recevoir le liquide de la sortie de liquide (12) d'au moins un des éléments de drainage (10).
26. Un système de drainage conformément à n'importe laquelle des revendications 11 à 25 comprenant une surface imperméable, la surface imperméable étant inclinée de façon à diriger le liquide vers l'élément de drainage.







REFERENCES CITED IN THE DESCRIPTION

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