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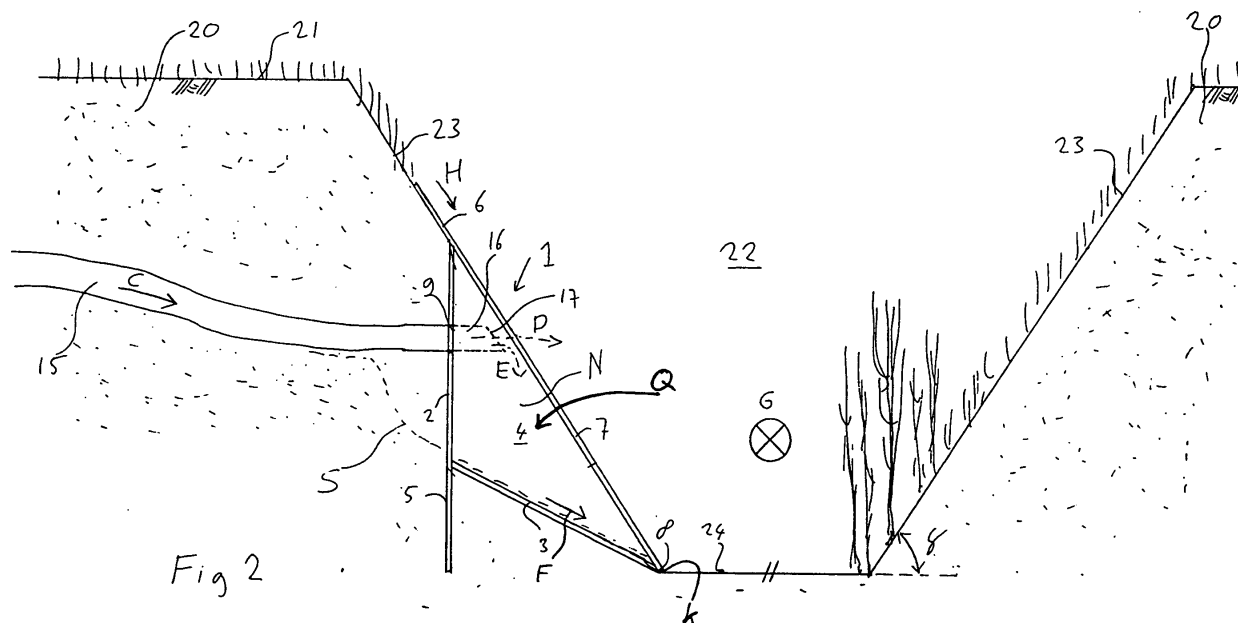
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(54) **Drainage device and arrangement including such drainage device**

(57) Insertion to be placed in an earth slope of a water course said earth slope being part of an earth body, wherein the insertion is tray-shaped for defining a niche in the slope and is provided with a passage for a water discharge pipe extending out of the earth body in order to drain in the water course by means of an end portion

accommodated in the niche, wherein the end of the end portion of the water discharge pipe is substantially situated in one plane with the slope or is receded with respect to the slope, **characterised in that** the insertion is provided with a ground anchor, such as a plate that extends substantially vertically from the lower side of the insertion.



Description

BACKGROUND OF THE INVENTION

[0001] The invention relates to an insertion for the end of a water discharge pipe draining in a water course and accommodated in an earth body. The invention furthermore relates to a water course provided with such an insertion. The invention furthermore relates to a method for placing a water discharge pipe for drainage into a water course.

[0002] Such water courses are also called ditch or waterway, but may also take the shape of broader waters, such as a lake. The water course is bounded by a natural slope, where vegetation may grow, such as grass, plants, shrubs or reed.

[0003] In the water course a water discharge pipe may debouch, protruding from the slope, in the profile of the water course. The water discharge pipe is situated in the earth body, and supplies water originating from the earth body itself, for instance a meadow having a clay substratum, from a cunette of a road, in which case there is question of a drainage pipe, or originating from another source, such as a septic tank or a precipitation collector.

[0004] The slope needs to be maintained, especially near ditches, in order to preserve the flow section. For that purpose the slope will be regularly mown, using a mowing bar extending downwardly inclined along the slope, and arranged on a tractor driving over the field along the slope.

[0005] As a result of the vegetation the driver of the tractor will not have a proper view on the elements protruding from the slope, such as water discharge pipes. It therefore often happens that the end portion of said pipe extending out of the slope is cut off by the mowing bar. The part of the pipe that is left behind in the ground may then get ruptured.

[0006] The vegetation may grow in front of the end of the pipe, as a result of which said end is difficult to see. The end of the pipe then cannot be found anymore. In case of drainage pipes, however, this will be necessary in order to be able to pass a hose for compressed water in said end for periodically flushing the drainage pipe in order to render the (filter) holes in the upstream portions of the drainage pipe free from soil material that may have penetrated in them or has been compressed in front of them.

[0007] Furthermore the vegetation may grow into the end opening of the pipe, and through the rupture in the water discharge pipe into the pipe. The flow passage in the pipe is thus made smaller and may even get closed off, as a result of which the discharging capacity of the pipe is reduced, possibly to none.

[0008] In the past some suggestions were made to place an insertion in a slope of a water course, however, placing them requires quite a lot of effort. A proper drainage is not always ensured either.

[0009] From British patent application 2.103.675 a tray

of glass fibre reinforced concrete is known, intended as outfall tray for an outfall pipe in a slope of a ditch. Around the opening the tray is provided with a circumferential flange, and at the upper side with a loop of rope or something similar, which during moulding has been embedded in the concrete. For anchorage of the tray an anchor line, for instance rope, is attached to the loop. The other end of the anchor line is attached to an anchor placed earlier in the ground by means of additional excavation, remote from the tray.

[0010] From European patent application 0.000.788 an outflow tray of glass fibre reinforced cement is known, which tray has also been provided with a flange extending around the opening. At the upper side a bracket is attached to the tray. For anchorage of the tray into the ground, a band of polyester is dug into the ground, wherein the band extends in the ground over a distance necessary for anchorage.

[0011] In European patent application 0.175.369 it is noted that the tray arrangement just mentioned requires a lot of time. It is suggested to accommodate gutters in the slope, which extend from the drainage pipe to slightly below water level.

SUMMARY OF THE INVENTION

[0012] It is an object of the invention to provide an insertion of the type mentioned in the preamble that is able to improve on this.

[0013] It is an object of the invention to provide an insertion that is easy to place.

[0014] It is an object of the invention to provide an insertion that has a simple structure and nonetheless can reliably be accommodated in the slope.

[0015] According to one aspect, for achieving at least one of said objects, the invention provides a water course provided with an insertion to be placed in an earth slope of a water course said earth slope being part of an earth body, wherein the insertion is tray-shaped for defining a niche in the slope and is provided with a passage for a water discharge pipe extending out of the earth body in order to drain in the water course by means of an end portion accommodated in the niche, wherein the end of the end portion of the water discharge pipe can be/is substantially situated in one plane with the slope or can be/is receded with respect to the slope, **characterised in that** the insertion is provided with a ground anchor. The ground anchor may for instance be a plate that is part of the insertion and that extends substantially vertically from the lower side of the insertion. Thus simultaneously with placing the insertion the necessary anchorage provision, for keeping the insertion in its place in the earth body while in use, is provided at the same time and additional actions for accommodating anchorage strands and such additional aids in the earth body need not be performed. The tray can easily and quickly be placed in the slope, after a recess has been made in there using for instance an excavator that is able to ride on the earth

body.

[0016] In an advantageous embodiment thereof, wherein the tray has an opening that is intended to be located in or near the plane of the slope, the tray has a ground retaining wall that is concave in a vertical plane of cross-section transverse to the opening, wherein the concave wall comprises a rear wall and a bottom wall that smoothly merge into each other or connect to each other at an angle (for instance in a buckle shape), wherein the tray at the convex outer side of the tray is provided with a downwardly extending anchoring plate.

[0017] When lowering the insertion in a recess made for that purpose in the slope, it will be possible to accommodate the anchoring plate into the ground in one motion.

[0018] In an embodiment that is simple as regards construction the downwardly extending anchoring plate forms an extension of the rear wall, it particularly is situated in one plane therewith. The strength of the ground anchor is also improved in this way.

[0019] The length of projection of the anchoring plate preferably is at least approximately the height of the rear wall. Described in another way, in case a transition between rear wall and bottom wall cannot be clearly perceived, the said length is at least approximately the height of the portion of the concave wall between the upper edge and the location of origin of the anchoring plate.

[0020] When the tray is provided with side walls, and the anchoring plate, considered in a horizontal direction transverse to the side walls, is situated parallel to the water course, within the space between the planes of the side walls, the side walls define the width of the tray and the recess in the slope can remain limited as regards width. Furthermore soil hardly needs to be filled up adjacent to the side walls, if at all.

[0021] The pipe preferably extends fittingly through the passage. The end portion of the water discharge pipe is thus kept vertically in its place.

[0022] The insertion may be provided with a flange intended to be located near the slope surface.

[0023] Placement is facilitated when at their edges the side walls are provided with flanges extending sideways and outwards, wherein moreover connection to the slope is enhanced. The side flange may form a flow-down surface for rain water fallen adjacent to the insertion and which passes soil particles of the slope surface along with it, in which way it is counteracted that said sediment-containing, polluted water ends up in the niche.

[0024] Placement of the insertion into the slope is further enhanced when the said concave wall is provided with an upper edge and a lower edge, wherein the upper edge is provided with a flange, wherein, preferably, the lower edge has no flange or the side flange or side flanges end freely at the level of the lower edge.

[0025] The flange at the edge of the side wall and the flange at the upper edge of the concave wall can be situated in one plane with each other and connect to each other.

[0026] According to one aspect, the invention further

or in addition to the above, provides an insertion to be placed in an earth slope of a water course said earth slope being part of an earth body, wherein the insertion is tray-shaped for defining a niche in the slope and is provided with a passage for a water discharge pipe extending out of the earth body in order to drain in the water course by means of an end portion accommodated in the niche, wherein the end of the end portion of the water discharge pipe is particularly substantially situated in one plane with the slope or is receded with respect to the slope, wherein the tray has an opening that is intended to be located in or near the plane of the slope, wherein the tray has a wall that is concave in a vertical plane of cross-section transverse to the opening, such as with a rear wall and a bottom wall that connects thereto at an angle, wherein the tray is provided with side walls, wherein the side walls have edges near the opening and wherein the concave wall in the lower area, such as the bottom wall, considered in projection in a plane parallel to the vertical plane of cross-section, encloses an angle of less than 45 degrees with the side wall edges. The lower area may connect to the opening. The bottom wall preferably is straight. The drainage over the concave wall is then enhanced at slope angles of 45 degrees or more.

[0027] Preventing damage to the water discharge pipe as a result of mowing need not be adversely affected when the bottom wall can be penetrated by vegetation. One can opt for giving the slope an as natural look as possible. When the location of the water discharge pipe should be found quickly, however, particularly in view of flushing, it is preferable that the concave wall, particularly the bottom wall, cannot be penetrated by vegetation, such as for instance high density polyethylene.

[0028] The insertion can be made by means of a moulding process, such as vacuum moulding or injection moulding, particularly of high density polyethylene.

[0029] Alternatively for smaller batches of insertions, the insertion can be assembled from a number of plates that are attached to each other, for instance by gluing or welding, wherein the plates are particularly made of high density polyethylene.

[0030] The insertion preferably is shape-retaining.

[0031] According to a further aspect the invention provides a water course provided with one or more insertions according to the invention, wherein the insertion extends from the slope into the earth body or terrain and remains substantially outside of the transverse profile, wherein the water discharge pipe connects to or is passed through a passage in the insertion and the end of the water discharge pipe is located at least almost outside of the transverse profile of the water course, preferably receded with respect to the slope.

[0032] In that way the water discharge pipe remains within the profile of the slope, so that a mowing bar following the slope will not touch the end portion of the pipe and the end portion of the pipe remains intact.

[0033] Preferably the end portion of the water discharge pipe extends with a length into the niche so that

the end is easy to perceive for insertion of a flushing hose. It is furthermore made certain in that way, that the end of the water discharge pipe remains within the niche, also when the pipe as a result of settings in the earth body is pulled slightly back into the earth body.

[0034] In one embodiment the passage has a centre line that is situated in a vertical plane that is substantially transverse to the water course. In an alternative embodiment the passage has a centre line that has a directional component that is substantially parallel to the water course or the slope, in horizontal direction alongside it.

[0035] When the insertion comprises a bottom wall that extends up to the slope the bottom of the niche is protected against washing out by water flowing out of the water discharge pipe. The discharge is enhanced when the bottom wall is substantially horizontal or slopes down towards the water course.

[0036] For ease of placement and/or counteracting pollution of the tray it is provided with a flange that is situated in or near the slope surface.

[0037] Instead of or in addition to the concave wall a side wall of the insertion may be provided with a passage for a pipe, so that also end portions of drainage pipes extending parallel to the water course or the slope (in horizontal direction alongside it) can be connected.

[0038] Substantially in one plane with the slope will also mean that the end may extend slightly, for instance 1 cm, out of the slope surface, for instance when an insertion with flange has been placed on young grass sods on a slope. The flange is then also situated within the transverse profile of the water course, yet due to the slight height of protrusion out of the slope not a hindrance to mowing bars.

[0039] According to a further aspect the invention provides a method for placing an insertion according to the invention in an earth slope of a water course, wherein with a dipper or bucket of an excavator a recess is made in the slope and the insertion is lowered into the recess while pressing the anchoring plate into the bottom of the recess, wherein, preferably, the lower edge of the tray, which edge is situated near the tray opening, is used as pivot point with the earth and the tray is tilted into the recess.

[0040] The aspects and measures described in this description and the claims of the application and/or shown in the drawings of this application may where possible also be used individually. Said individual aspects may be the subject of divisional patent applications relating thereto. This particularly applies to the measures and aspects that are described per se in the sub claims.

SHORT DESCRIPTION OF THE DRAWINGS

[0041] The invention will be elucidated on the basis of an exemplary embodiment shown in the attached drawings, in which:

Figures 1A and 1B, show a cross-section according

to plane M (figure 1B) and a front view of an exemplary embodiment of an insertion according to the invention, respectively, and;

Figure 2 shows the insertion of figures 1A and 1B in a condition in which it has been placed at a water course.

DETAILED DESCRIPTION OF THE DRAWINGS

[0042] The insertion 1 of figures 1A and 1B is for instance made of synthetic material, particularly high density polyethylene, HPE, by injection moulding. The insertion 1 comprises an upright rear wall 2 and a bottom wall 3, which together define a buckled concave wall. At the side edges of the rear wall 2 and the bottom wall 3 they merge into side walls 4 situated in upright planes, which side walls are substantially parallel in this example. The walls 2, 3 and 4 form a tray. From the upper edges of the side walls 4, flanges 7 project sideways, which flanges are in one plane with a flange 6 that connects to the upper edge 10 of the rear wall 2. The lower edge 8 is not provided with a flange. The side flanges 7 thus end freely at the bottom, in line with the lower edge 8. The flanges 6, 7 surround the opening 12 of the tray-shaped insertion at three sides. The vertical plane of cross-section M is transverse to the opening.

[0043] The rear wall 2 is provided with a hole 9 for passage of a water discharge pipe. Optionally one of the side walls 4 or both side walls 4 may be provided with a comparable hole 9'.

[0044] The rear wall 2 is downwardly lengthened in a downwardly extending plate 5, which may serve as ground anchor. The walls 2/5 and 3 are situated between the side walls 4, thus within the spatial contours defined by the side walls 4. The flanges 7 extend beyond them.

[0045] At the location of the lower edge 8 of bottom wall 3 the bottom wall 3 encloses an angle α with the upper edge 11 of the side walls 4 of less than 45 degrees, in this case for instance 30 degrees. The angle β between the rear wall 2 and the bottom wall 3 in this case is approximately 120 degrees. The width B of the insertion in this example is 0.6 m, having a width b1 of flange 7 of 0.10 m and a width b2 of the walls 2/5 and 3 of 0.4 m. The height H of the insertion 1 in this example is 0.7 m, measured parallel to the wall 2/5, wherein the height h1 of the flange 6 is 0.1 m, the height h2 of the rear wall 2, without extension plate 5, is 0.4 m and the height h3 of the plate 5 is 0.2 m. The diameter of the passage 9 in this example is for instance 82 mm, for a water discharge pipe designed as drainage pipe here and having a diameter of 8 cm. The thickness of the walls can be 10 mm.

[0046] The walls 2/5, 3 and 4 and flanges 6 and 7 may also be made of plate material and for assembly of the insertion 1 be glued or welded together.

[0047] The degree of downward projection of the wall 2/5 may differ, depending on the slope incline of the water course in question. The steeper the slope, the longer the

projecting length, related to the height of the rear wall 2. The length of projection of the wall section 5 will preferably be at least half the height of the rear wall. The wall section 5, may, considered in a downward direction parallel to said wall section, extend to below the lower edge 8.

[0048] Figure 2 shows a sand-containing earth body 20 having ground level 21 grown with grass. The earth body 20 is interrupted by a ditch 22, that is bounded by a bottom 24 and slopes 23. The slopes 23 are at an angle γ to the horizontal of approximately 60 degrees.

[0049] A drainage pipe 15 is accommodated in the earth body 20, which pipe supplies water that is received in the drainage pipe 15 elsewhere at some distance, for instance via drainage holes provided in the pipe 15.

[0050] Instead of letting the drainage pipe having end portion 16 extend out of the slope 23 with end 17, and therefore in the profile of the ditch 22, in one embodiment according to the invention first a recess is made in the slope 23 using a dipper extending from ground level 21, the recess having a width of approximately 0.4 m, corresponding with a common width of a small excavator bucket of a dipper, see, digging line S.

[0051] Subsequently the insertion 1 is placed in the recess, wherein the flangeless lower edge 8 comes to support on the bottom at the location of k. There a tilting point is formed for the insertion 1, that can be tilted about it in the direction Q until in the recess. The side walls 4 move just along the side planes of the recess and the plate 5 is pressed into the ground in the tilting motion and the earth abuts the wall 3. Then the end portion 16 of the drainage pipe 15 laid in a trench is inserted through the hole 9, after which said end portion is supported by the hole edge and with end 17 is receded a few cm with respect to the plane in which the flanges 6, 7 are situated and receded a few cm with respect to the slope. Then the soil behind the insertion 1 and in the trench is further filled up to ground level. The drainage pipe has a diameter of 8 cm and fits such into the hole 9 that passage of soil through the hole is counteracted. Optionally a sealing means such as tape can be used. The flanges 6 and 7 are situated flat on the slope 23, tightly against it. In case of young grass sods on the slope the flange may press against the grass, and the flanges will therefore project slightly from the slope surface. In case of older vegetation it will be removed and the flanges 6, 7 come to lie slightly recessed in the slope.

[0052] The insertion 1 then bounds a niche N in the slope 23, in its entirety, wherein the rear wall 2 retains soil material and the side walls 4 do the same in a direction perpendicular to the plane of the drawing. The plate 5 functions here as ground anchor against a movement of the insertion 1 towards the water course 22.

[0053] Water that flows via the drainage pipe 15 in the direction C at a high flow rate is discharged in the direction D to the water course 22. At a low flow rate there will rather be more question of seeping, wherein the water falls in the direction E on the downwardly sloping bottom wall 3, and flows down along it in the direction F, depend-

ing on the water level. The water in the water course is discharged in direction G.

[0054] Water flowing down over the upper part of the of the slope 23, direction H, is guided by the flanges 6 and 7 up into the niche N or along the flanges 7. In that case it is counteracted that water ends up between the wall 2 and the side walls 4 and the earth body 20. The plate 5 also ensures an extension of a leakage path.

[0055] When the slope is mown, the mowing bar will move over the flanges 6 and 7 and not touch the end 17 of the drainage pipe 15. The end portion 16 of the drainage pipe 15 is easily recognizable and easily reachable for inserting a flushing hose therein.

[0056] The above description is included to illustrate the operation of preferred embodiments of the invention and not to limit the scope of the invention. Starting from the above explanation many variations that fall within the spirit and scope of the present invention will be evident to an expert.

Claims

1. Insertion to be placed in an earth slope of a water course said earth slope being part of an earth body, wherein the insertion is tray-shaped for defining a niche in the slope and is provided with a passage for a water discharge pipe extending out of the earth body in order to drain in the water course by means of an end portion accommodated in the niche, wherein the end of the end portion of the water discharge pipe can particularly be substantially situated in one plane with the slope or can be receded with respect to the slope, **characterised in that** the insertion is provided with a ground anchor, such as a plate that is part of the insertion and extends substantially vertically from the lower side of the insertion.
2. Insertion according to claim 1, wherein the tray has an opening that is intended to be located in or near the plane of the slope, wherein the tray has a wall that is concave in a vertical plane of cross-section transverse to the opening, wherein the concave wall comprises a rear wall and a bottom wall that smoothly merge into each other or connect to each other at an angle, wherein the tray at the convex outer side of the tray is provided with a downwardly extending anchoring plate, wherein preferably, the downwardly extending anchoring plate forms an extension of the rear wall, particularly is situated in one plane therewith.
3. Insertion according to claim 2, wherein the length of projection of the anchoring plate is at least approximately the height of the rear wall, or at least approximately the height of the part of the concave wall between the upper edge and the location of origin of the anchoring plate.

4. Insertion according to claim 2 or 3, wherein the tray is provided with side walls, wherein the anchoring plate, considered in a horizontal direction transverse to the side walls, is situated parallel to the water course, within the space between the planes of the side walls. 5
5. Insertion according to the preamble of claim 1 or according to any one of the preceding claims, wherein the tray is provided with side walls, wherein at their edges the side walls are provided with a side flange extending sideways. 10
6. Insertion according to any one of the claims 2-5, wherein the concave wall is provided with an upper edge and a lower edge, wherein the upper edge is provided with a flange, wherein, preferably, the lower edge has no flange or wherein the side flange or side flanges end freely at the level of the lower edge. 15
7. Insertion according to claims 5 and 6, wherein the flange at the edge of the side wall and the flange at the upper edge of the concave wall are situated in one plane with each other and connect to each other. 20
8. Insertion according to the preamble of claim 1 or according to any one of the preceding claims, wherein the tray has an opening that is intended to be located in or near the plane of the slope, wherein the tray has a wall that is concave in a vertical plane of cross-section transverse to the opening, such as with a rear wall and a bottom wall that connects thereto at an angle, wherein the tray is provided with side walls, wherein the side walls have edges near the opening and wherein the concave wall in the lower area, such as the bottom wall, considered in projection in a plane parallel to the vertical plane of cross-section, encloses an angle of less than 45 degrees with the side wall edges. 25
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9. Insertion according to any one of the preceding claims, made by means of a moulding process, such as vacuum moulding or injection moulding, particularly high density polyethylene. 40
10. Insertion according to any one of the claims 1-8, wherein the insertion is assembled from a number of plates that are attached to each other, for instance by gluing or welding, wherein the plates are particularly made of high density polyethylene. 45
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11. Insertion according to any one of the preceding claims, when depending on claim 2, wherein the concave wall, particularly the bottom wall of the insertion, cannot be penetrated by vegetation. 55
12. Water course provided with one or more insertions according to any one of the preceding claims, where-
in the insertion extends from the slope into the earth body or terrain and remains substantially outside of the transverse profile, wherein the water discharge pipe connects to or is passed through a passage in the insertion and the end of the water discharge pipe is located at least almost outside of the transverse profile of the water course.
13. Water course according to claim 12, wherein the bottom wall of the insertion extends up to the slope and is substantially horizontal or slopes down towards the water course.
14. Water course according to claim 12 or 13, wherein the insertion is designed according to claim 5, 6 or 7, wherein the flange is situated in or near the slope surface.
15. Method for placing an insertion according to any one of the claims 1-11 in an earth slope of a water course, when depending on claim 2, wherein with a dipper of an excavator a recess is made in the slope and the insertion is lowered into the recess while pressing the anchoring plate into the bottom of the recess, wherein, preferably, the lower edge of the tray which edge is situated near the tray opening, is used as pivot point with the ground and the tray is tilted into the recess.

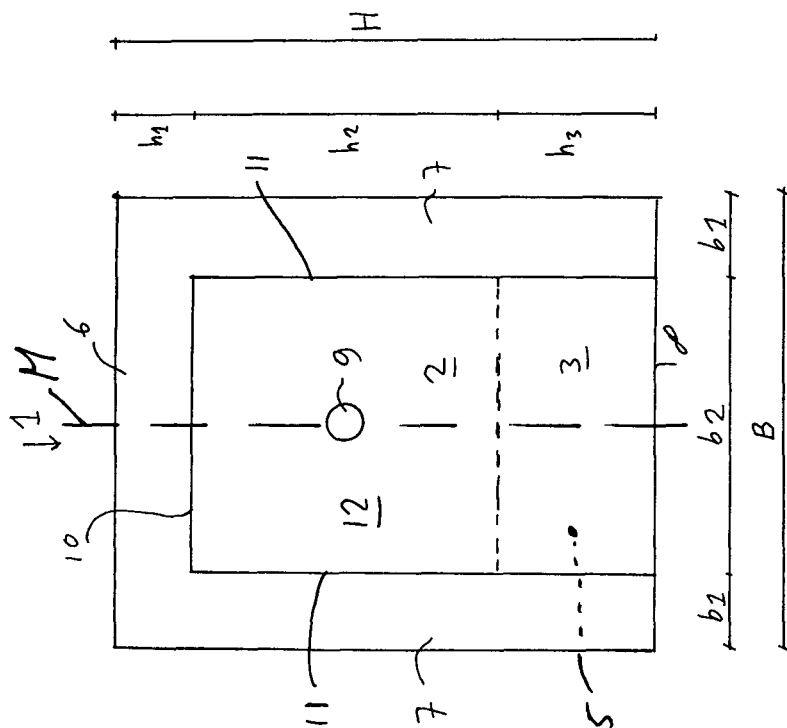


Fig 1B

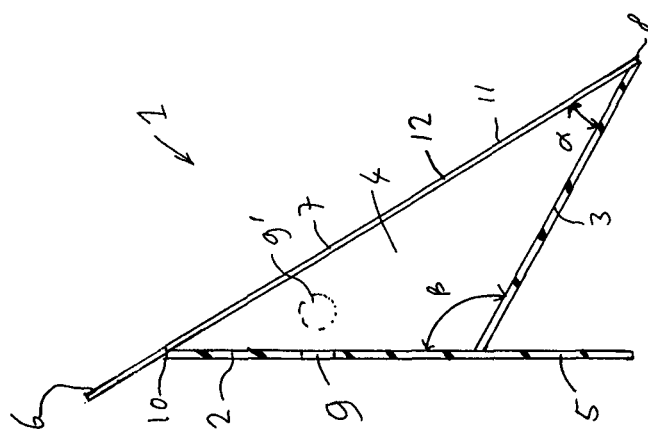


Fig 1A

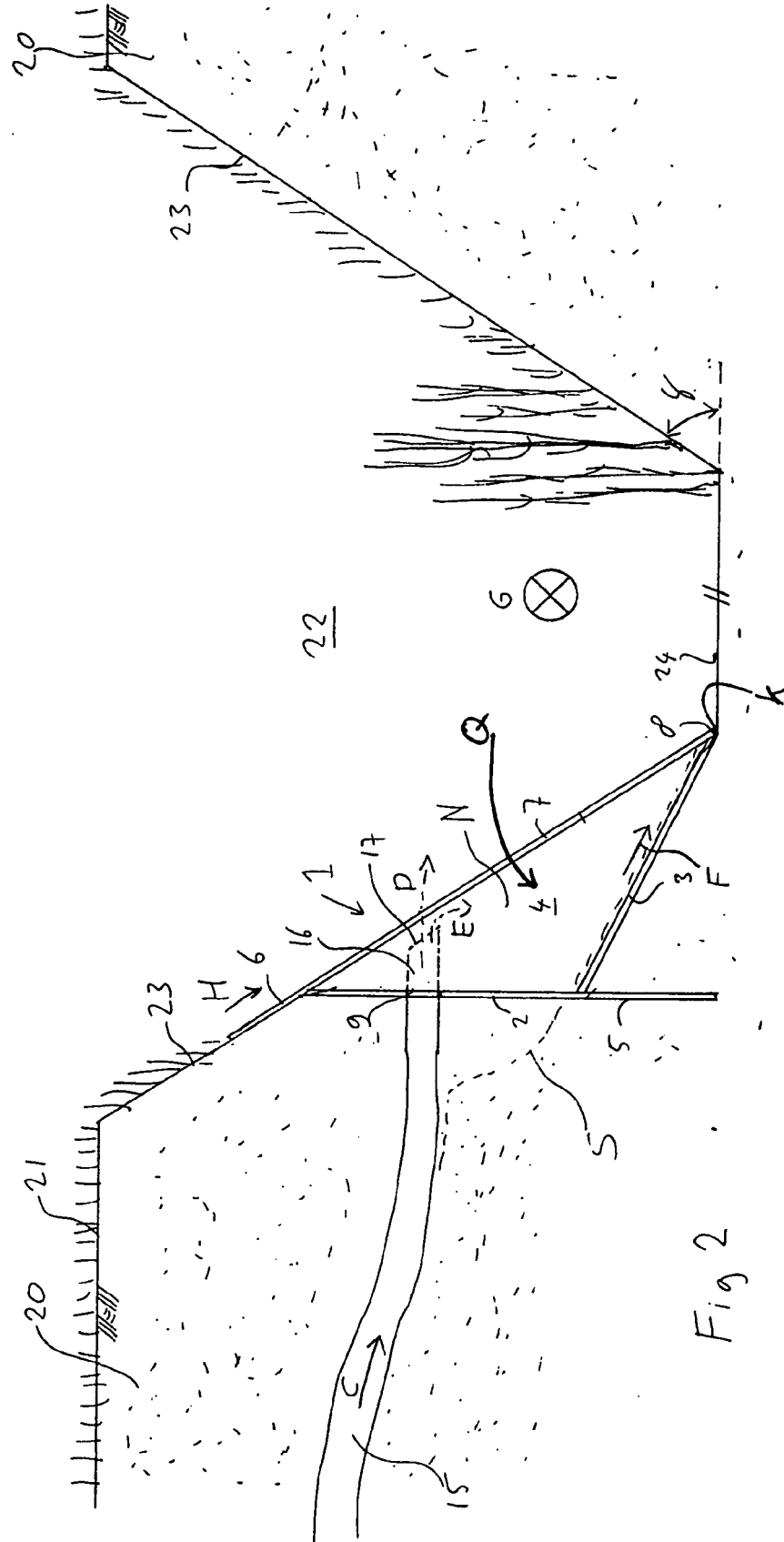


Fig 2



EUROPEAN SEARCH REPORT

Application Number
EP 09 01 2661

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 1 February 2010	Examiner De Coene, Petrus
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			

 1
EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 09 01 2661

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
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01-02-2010

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