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

(11) **EP 1 546 474 B1**

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
02.12.2009 Bulletin 2009/49

(21) Application number: **03794377.6**

(22) Date of filing: **25.08.2003**

(51) Int Cl.:
E03F 5/14 *(2006.01)*

(86) International application number:
PCT/SE2003/001290

(87) International publication number:
WO 2004/022864 (18.03.2004 Gazette 2004/12)

(54) **STREET INLET**

STRASSENEINLASS

DRAIN D'EVACUATION DES EAUX PLUVIALES

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HU IE IT LI LU MC NL PT RO SE SI SK TR

(30) Priority: **04.09.2002 SE 0202620**

(43) Date of publication of application:
29.06.2005 Bulletin 2005/26

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Description

TECHNICAL FIELD

BACKGROUND ART

[0001] Historically, there has long been some form - in particular in cities - of stormwater drains or "street inlets" for ensuring that water is run off from the streets. Initially, there was no intention to treat this water, and its level of pollution was at any rate also of limited extent. In order to prevent large impurities, for example in the form of branches or the like, from accompanying the water down into the stormwater drains and blocking the sewer system, various designs of grids are provided so as to cover the stormwater drains. In addition, the grids serve the function of allowing vehicles and pedestrians to pass over the stormwater drain.

[0002] With the passage of time, various different devices inside the stormwater drains have also been developed for accumulating solid pollutants, principally finely-divided pollutants that pass through the grid. A countersink has quite simply been provided, a so-called sand trap, in which grit and the like are accumulated and stay there while the water runs off through an outlet and further into the sewer system. Where necessary, for example when the accumulated matter fills the greater part of the sand trap, this is emptied.

[0003] At the same rate as stormwater becomes increasingly polluted and environmental awareness is steadily growing, a need has become recognised for further treatment of the stormwater in addition to mechanical separation pure and simple. Nowadays, stormwater contains many pollutants that are dissolved in the water, for example copper, lead, mercury, other heavy metals, petrol, solvents etc. The quantity and type of pollutants depend largely on the environment which surrounds each stormwater drain. Hence, the level of pollution is higher in areas of dense traffic, at filling stations and in certain industrial estates. Even the type of roof

Technical field

[0004] The present invention relates to a stormwater drain comprising an openable grid, a first filter for treating the stormwater, a sand trap for collecting solid pollutants, a channel connected to the sand trap for emptying thereof, and an outlet for the treated stormwater, whereas the filter is disposed outside and around the channel with a circumferential surface which is permeable for realising a radial flow component in the stormwater through the filter. covering in a residential area may affect the level of pollution in the stormwater, since acidic rainwater may release certain metals from roofs of, for example, copper sheeting.

[0005] As a result, various types of filters have now begun to be provided in the stormwater drains. Such filters are usually provided together with sand traps in inserts. In order to make it possible to empty sand and grit or gravel out of the insert, the whole of the insert must be lifted out. This is a heavy and time-consuming operation. Another problem is that the inserts are disposed close to the grid in order to simplify the lifting operation, which implies that they are visible to all those who pass the stormwater drain and look down through the grid. Unfortunately, this results in the inserts being stolen or vandalised since it is possible to lift them out.

[0006] Stormwater drains more or less of the art mentioned introductorily are known. Thus in the Swedish Patent Specification SE 512 577 C2 there is disclosed a filter unit comprising a vertical channel for stormwater, surrounded by a filter unit. There is an upper cover with holes of increasing flow capacity radially from the axis. The flow is, however, primarily axial. In the UK Patent specification GB 2 360 713 A there is disclosed in figure 4, a stormwater drain of the art mentioned introductorily. Here, the sand trap is disposed at the side of a container in which a filter is arranged, surrounding a channel starting from the half height of the sand trap, wheres the channel then bends down to a vertical direction, surrounded by the filter. This stormwater drain demands, for a certain capacity, a fairly large extension in the horizontal plane.

PROBLEM STRUCTURE

[0007] The object of the present invention is thus to realise a stormwater drain which features both filtering and separation of sold pollutants, in which the emptying of the solid pollutants may be simply and rapidly carried out. At the same time, the degree of treatment in the filtering operation must be at least on a par with prior art systems.

SOLUTION

Solution

[0008] The object of the present invention is to create an efficient stormwater drain of the art mentioned introductorily, that features both filtering and separation of solid pollutants in an efficient way, and that enables easy emptying of sand from the sand trap.

[0009] According to the invention this is achieved in that the first filter is disposed above the sand trap, which is defined by an upper wall, which extends in the transversal direction of the drain, which upper wall is arranged to separate the filtered stormwater from the untreated stormwater within the sand trap and the channel.

[0010] Further embodiments of the stormwater drain according to the invention are defined in the dependent patent claims 2 to 5.

BRIEF DESCRIPTION OF THE ACCOMPANYING DRAWINGS

[0011] The present invention will now be described in

greater detail hereinbelow, with reference to the accompanying Drawings. In the accompanying Drawings:

Fig. 1 is a partly cut away perspective view of the stormwater drain according to the present invention; and

Fig. 2 is a detailed view of an alternative embodiment of the present invention.

DESCRIPTION OF PREFERRED EMBODIMENT

[0012] Fig. 1 shows a stormwater drain which is largely constructed as follows. Uppermost, i.e. at ground level, there is disposed a grid 2 which permits the passage of the stormwater or rainwater while coarser solid objects such as branches are separated off. Below the grid, there is disposed a connecting section 3 which leads the water that has passed through the grid 2 down into a subjacent channel 4.

[0013] Outside and around the channel 4, there are disposed filters 5 and 6 which, in the preferred embodiment, are two in number. The channel 4 discharges in a sand trap 7 where solid particles in the stormwater, such as sand and grit fall to the bottom and remain there. Outside the sand trap 7, there is disposed an outlet 8 for leading off the filtered stormwater.

[0014] A number of different versions of the grid 2 are possible. The apertures in the grid 2 should permit as much water as possible to run through the grid 2 during a predetermined period of time, at the same time as the apertures and there shape in the grid 2 lead to an efficient separation of solid pollutants and foreign matter. The grid 2 may be opened, which can be realised for example in that the grid is hinged or in that it can be lifted off entirely. Possibly, opening of the grid 2 may require some form of special tool or implement in order to impede unauthorised access to the stormwater drain.

[0015] The connecting section 3 is substantially funnel-shaped. Its upper edge 9 extends around the apertures in the grid 2 so that all water which runs through the grid is entrapped by the connecting section 3 and led downwards into the stormwater drain 1. At the same time, the connecting section 3 conceals those parts of the stormwater drain which are disposed outside the channel 4. As a result, potential vandals are not tempted to attack the stormwater drain 1.

[0016] In order to keep the connecting section 3 in position beneath the grid 2, the upper edge 9 is fixedly clamped between a downwardly extending flange 10 on the underside of the grid 2 and a clamping member 11.

[0017] The lower region of the connecting section 3 is designed as a spillway overflow 12. In the event of an extreme water flow, there is the risk that the water will not have time to be filtered at the same rate as it flows into the stormwater drain 1. In such instance, the channel 4 will be filled. In order to ensure that the water cannot run off at all, the spillway overflow 12 is disposed such that unfiltered stormwater is led past the filters 5 and 6 to the outlet 8.

[0018] From the connecting section 3, the channel 4 leads down to the sand trap 7. The channel 4 thus extends through the greater part of the stormwater drain 1. In the preferred embodiment, the channel 4 is substantially vertical so as to make for the lowering of a hose or the like for sucking up sand, leaves, sludge and other solid matter which has sedimented to the bottom of the sand trap 7. The only requirement for emptying the sand trap 7 is that the grid 2 is opened or lifted off. Consequently, emptying is considerably simplified and, as a result, requires less physical effort and time consumption. At the same time, there is no reduction in the efficiency of the filtering of the water.

[0019] In order that the water in the channel 4 will reach the first filter 5, the channel 4 is provided with a large number of holes through which the water flows out to the first filter 5. The size of the holes 13 is mutually uniform in Fig. 1, but it is possible to vary the hole size along the length of the channel 4 in order to realise an optimum distribution of the water flow through the first filter 5.

[0020] As was mentioned above, the first filter 5 is disposed outside the channel 4 as a sleeve or a pipe with relatively thick walls. In the preferred embodiment, the pipe is cylindrical, but may naturally also have other configurations, for example a rectangular or hexagonal cross section. This form of the first filter 5 makes it possible for the sand trap 7 to be emptied through the channel 4 without the first filter 5 needing to be dismounted. The first filter 5 is disposed for a flow with a component which is substantially radial. The pressure in the water column which is in the channel 4 is equal in all directions at a given depth, and the radial flow component is hereby imparted to the water, which is desirable in the flow through the first filter 5. Capillary forces in the mass in the first filter 5 also contribute to the radial flow component. However, these forces acct in all directions, including downwards. The force of gravity also acts straight downwards. Taken as a whole, the water will flow obliquely downwards and outwards through the first filter 5. The outer defining surfaces of the filter 5 are permeable so that the treated water may pass therethrough and run downwards along the circumferential surface or side surfaces 19 of the first filter 5.

[0021] Below the first filter 5, a second filter 6 is provided. Like the fist filter 5, the second filter 6 is disposed around the channel 4 and outside it. The flow path through the second filter 6 differs, however, from that through the first filter 5. The second filter 6 is permeable at its upper and lower ends so that the flow path through the second filter 6 will be substantially axial. All water that flows out from the first filter 5 is entrapped on the upper surface 14 of the second filter 6. In the second filter 6, the circumferential surface is watertight. The channel 4 is similarly completely tight in the region of the second filter 6. Thus, radial flow through the second filter 6 is avoided.

[0022] The filtering materials in the two filters 5 and 6 differ from one another in the preferred embodiment. Typically, they are disposed to filter off and bond different types of pollutants. As a result, the filter complement one another and improved purification treatment is attained compared with if only one filter had been provided.

[0023] In the sand trap 7, grit and other solid pollutants sink to the bottom and can thereafter be collected. The sand trap 7 has a sealing, upper wall 15 which separates the immediately accumulated water inside the sand trap 7 and the channel 4 from the water which had been filtered through the filters 5 and 6 and which is to be led off through the outlet 8.

[0024] The stormwater drain 1 according to the present invention works as follows. Stormwater, or rainwater, falls down through the grid 2 via the connecting section 3 and down into the channel 4. When the water flows downwards through the channel 4, only a minor fraction will reach the filter 5. Instead, the water runs down to the sand trap 7 where the solid pollutants sediment to the bottom. The water level in the sand trap 7 rises and will in due course reach a distance up in the channel 4. When the water level has risen so far that it reaches up to the holes 13 inside the first filter 5, the water will flow outwards through the filter 5 and also downwards therethrough. When the water has reached the outside 19 of the first filter 5, it runs along the outside and down into the second filter 6. The water is filtered in the second filter 6 and runs out through its bottom 20 and further out to the space 16 above the sand trap 7 from whence it is led out through the outlet 8.

[0025] In extreme water flows, the channel 4 is surcharged to a level above the holes 13 and does not have time to flow out through the filter 5 at a sufficiently rapid rate. In such instance, the unfiltered water runs out through the spillway overflow 12 and past the filters 5 and 6. In this instance, unfiltered water will reach the outlet 8, which is not desirable. The system should therefore be dimensioned so that this situation practically never occurs.

DESCRIPTION OF ALTERNATIVE EMBODIMENTS

[0026] It is often desirable to retrofit a stormwater drain 1 according to the present invention inside an existing stormwater drain of older model. In this instance, use is made of the drain shaft which is already in position in many places and it is thereby possible to avoid costly installation work. However, the stormwater drain 1 according to the present invention may need to be modified somewhat, since the dimensions of the prior art stormwater drains vary within generous limits. It is conceivable that the sand trap 7, in the manner illustrated in Fig. 2, does not reach out to the outer walls 17 of the drain shaft. This will have as a result that the collection space 16 is disposed not only above the upper wall of the sand trap 7 but also between the circumferential surface 18 of the sand trap 7 and the outer wall 17 of the drain shaft. This has no major effect on the function of the stormwater drain, other than that greater volumes of filtered stormwater are retained in the stormwater drain before running off through the outlet 8.

[0027] Another method of modifying the present invention is to provide additional filters. However, these additional filters are designed as the second filter 6 and are disposed below it. The outer diameter of the additional filters is equal to or slightly larger than the immediately superjacent filter, so that the water that runs out therefrom is reliably entrapped by the subjacent filter. A larger number of filters permits a purification treatment in additional steps where the filter compounds are adapted so as to filter off and retain different types of pollutants. The present invention may be further modified without departing from the scope of the appended Claims.

Claims

1. A stormwater drain (1) comprising an openable grid (2), a first filter (5) for treating the stormwater, a sand trap (7) for collecting solid pollutants, a channel (4) connected to the sand trap (7) for emptying thereof, and an outlet (8) for the treated stormwater, whereas the filter (5) is disposed outside and around the vertically extending channel (4) with a circumferential surface (19) which is permeable for realising a radial flow component in the stormwater through the filter (5)
characterised in that
the first filter (5) is disposed above the sand trap (7), which is defied by an upper wall (15), which extends transversly to the longitudinal direction of the drain, which upper wall (15) is arranged to separate the filtered stormwater from the untreated stormwater within the sand trap (7) and the channel (4).

2. A stormwater drain according to claim 1
characterised in that
there is disposed, between the grid (2) and the channel (4), a connecting section (3) of funnelshaped configuration.

3. A stormwater drain according to claim 1 or 2,
characterised in that
a spillway overflow (12) is provided in the channel (4) for leading the stormwater past the filter (5).

4. A stormwater drain according to any of claims 1 to 3,
characterised in that
at least one additional filter (6) is provided below the first filter (5),

5. A stormwater drain according to claim 4,
characterised in that
the additional filter (6) has permeable upper and lower defining surfaces (14,20) for realising an axial flow

component through the filter (6).

Patentansprüche

1. Regenwasser-Abfluss (1) mit einem Gitter (2), das geöffnet werden kann, einem ersten Filter (5) zum Behandeln des Regenwassers, einem Sandfang (7) zum Sammeln von festen Schmutzteilen, einem Kanal (4), der mit dem Sandfang (7) zu dessen Entleerung verbunden ist, sowie einem Auslass (8) für das behandelte Regenwasser, wobei der Filter (5) außerhalb und um den sich vertikal erstreckenden Kanal (4) mit einer Umfangsfläche (19) angeordnet ist, die zur Realisierung einer radialen Strömungskomponente in dem Regenwasser durch den Filter (5) permeabel ist,
dadurch gekennzeichnet, dass der erste Filter (5) über dem Sandfang (7) angeordnet ist, der durch eine obere Wand (15) abgegrenzt ist, die sich quer zur Längsrichtung des Abflusses erstreckt, wobei die obere Wand (15) so angeordnet ist, dass sie das gefilterte Regenwasser von dem nicht behandelten Regenwasser in dem Sandfang (7) und dem Kanal (4) trennt.

2. Regenwasser-Abfluss nach Anspruch 1,
dadurch gekennzeichnet, dass zwischen dem Gitter (2) und dem Kanal (4) ein trichterförmiger Verbindungsabschnitt (3) angeordnet ist.

3. Regenwasser-Abfluss nach Anspruch 1 oder 2,
dadurch gekennzeichnet, dass in dem Kanal (4) ein Überlauf (12) vorgesehen ist, mit dem das Regenwasser an dem Filter (5) vorbeigeführt wird.

4. Regenwasser-Abfluss nach einem der Ansprüche 1 bis 3,
dadurch gekennzeichnet, dass mindestens ein zusätzlicher Filter (6) unter dem ersten Filter (5) vorgesehen ist.

5. Regenwasser-Abfluss nach Anspruch 4,
dadurch gekennzeichnet, dass der zusätzliche Filter (6) permeable obere und untere, diesen abgrenzende Flächen (14, 20) zur Schaffung einer axialen Strömungskomponente durch den Filter (6) aufweist.

Revendications

1. Drain d'évacuation des eaux pluviales (1) comprenant une grille ouvrable (2), un premier filtre (5) pour traiter les eaux pluviales, un dessableur (7) pour recueillir des polluants solides, un canal (4) relié au dessableur (7) pour vider celui-ci, et un orifice de sortie (8) pour les eaux pluviales traitées, tandis que le filtre (5) étant disposé à l'extérieur et autour du canal (4) s'étendant verticalement, avec une surface circonférentielle (19) qui est perméable pour réaliser une composante radiale d'écoulement dans des eaux pluvialts à travers le filtre (5)
caractérisé en ce que
le premier filtre (5) est disposé au-dessus du dessableur (7), qui est défini par une paroi supérieure (15), qui s'étend transversalement par rapport à la direction longitudinale du drain, laquelle paroi supérieure (15) est disposée afin de séparer les eaux pluviales filtrées des eaux pluviales non traitées dans le dessableur (7) et le canal (4).

2. Drain d'évancuation des eaux pluviales selon la revendication 1,
caractérisé en ce que
un tronçon de connexion (3) d'une configuration en entonnoir est disposé entre la grille (2) et le canal (4).

3. Drain d'évacuation des eaux pluviales selon la revendication 1 ou 2,
caractérisé en ce que
un trop-plein de déversement (12) est agencé dans le canal, (4) pour guider les eaux pluviales à travers le filtre (5).

4. Drain d'évacuation des eaux pluviales selon l'une quelconque des revendications 1 à 3.
caractérisé en ce que
au moins un filtre supplémentaire (6) est agencé audessous du premier filtre (5).

5. Drain d'évacuation des eaux pluviales selon la revendication 4,
caractérisé en ce que
le filtre supplementaire (6) a des surfaces limites supérieure et inférieure perméables (14, 20) pour réaliser une composante axiale d'écoulement à travers le filtre (6).

Fig 1

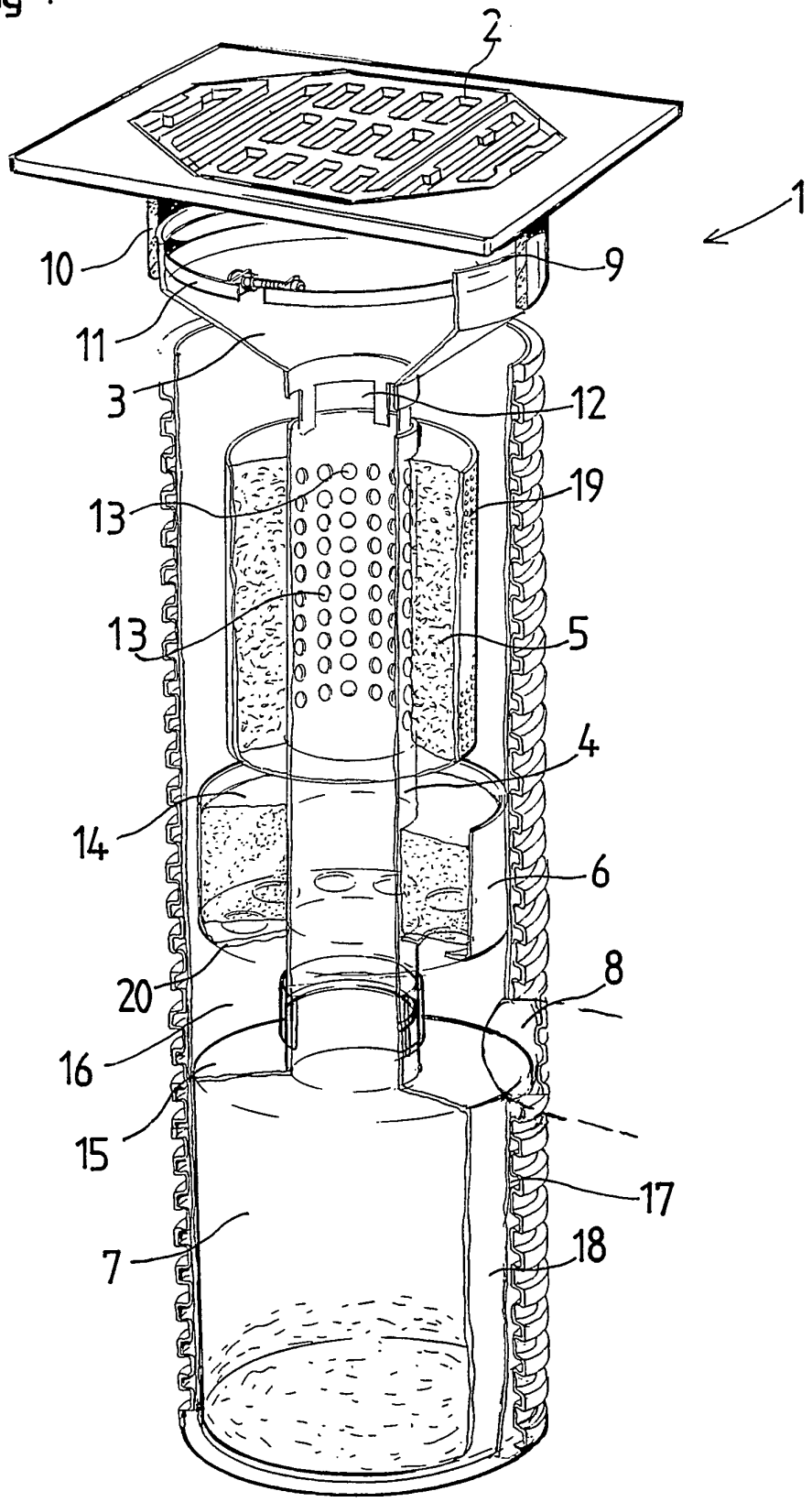
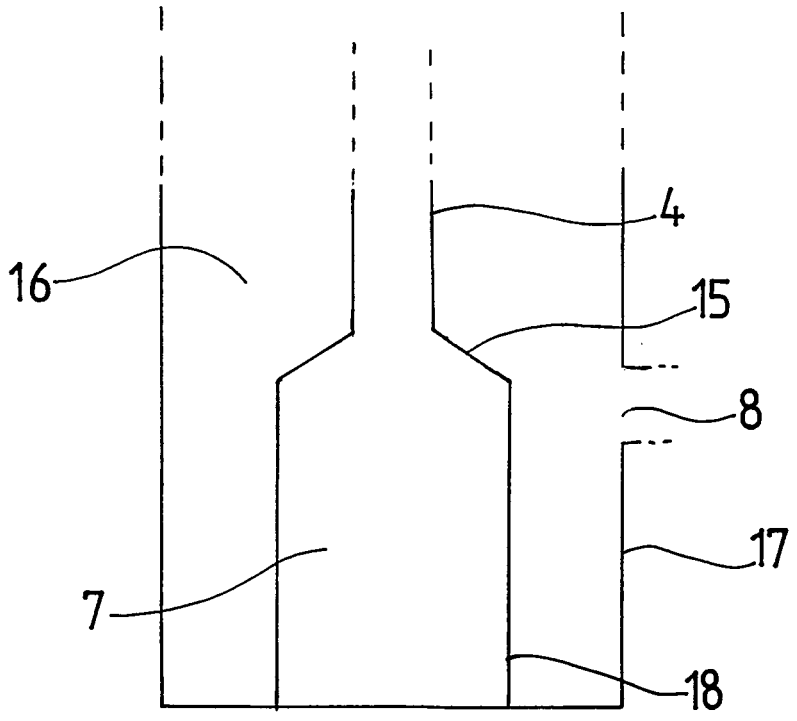


Fig 2



REFERENCES CITED IN THE DESCRIPTION

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