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Description

[0001] The invention relates to a shaft in accordance with the preamble of claim 1.

[0002] Known from DE 20 2013 101 256 U1 is a generic shaft that is not only used to collect and conduct water but also enables surface water that has flowed into the shaft to be treated. The shaft incorporates for this purpose a chamber referred to as a settling chamber or sedimentation chamber. In the settling or sedimentation chamber the water is calmed so that particles contained in the water can settle in the settling or sedimentation chamber. The shaft could therefore be referred to as a sedimentation shaft.

[0003] Besides calming the water and the sedimentation associated with it the generic shaft enables the water to be cleaned by filtration. The shaft could therefore be referred to as a filtration shaft.

[0004] For the purposes of the present proposal the shaft is referred to as a sedimentation shaft, if water is treated by sedimentation without filtration as well. The shaft is for the purposes of the present proposal referred to as a filtration shaft, if water is treated by filtration, whether or not sedimentation is provided for as well. Because of the different ways of treating water that has flowed into the shaft the difference between sedimentation and filtration shafts is significant in that the quantity of water that can be treated per time unit may be considerably greater in the case of a sedimentation shaft than in the case of a filtration shaft, whereas a filtration shaft enables water to be cleaned more thoroughly.

[0005] Raw – that is, untreated – water runs into the shaft from the surface of the ground through, for example, a channel. The water may be liquid or melt water that runs into the shaft from open areas, roads, pavements and paths or from roof surfaces onto the surface of the ground or into the channel and from there into the shaft. The water flowing out of the shaft is after treatment in the shaft referred to as clean water.

[0006] Known from WO 96/07483 A1 is a device constructed as a filtration shaft and incorporating a shaft with a hole in it that serves as an inlet hole for untreated raw water and a tangential outlet hole for treated water. Disposed between these two holes is a chamber that incorporates a settling surface for particles contained in the raw water. Disposed in the shaft and above the inlet hole is a separating tray. This separating tray incorporates a hole that connects to a rising pipe rising upwards the outlet from which is disposed a distance above the separating tray. An intermediate wall in the rising pipe causes a rotating flow formed in the chamber to be converted in the rising pipe into a linearly rising flow. Positioned above the separating tray and radially outside the rising pipe is an annular chamber that is filled with a filtration material. Water flowing out of the outlet of the rising pipe runs into the annular chamber and is filtered before it reaches the outlet hole of the device.

[0007] The purpose of the invention is to improve a generic sedimentation shaft so that the sedimentation shaft enables even large amounts of inflowing raw water to be effectively calmed.

[0008] This problem is solved by a shaft having the features of claim 1. Advantageous embodiments are described in the subclaims.

[0009] In other words the invention proposes making the water run from bottom to top and in doing so flow through a spiral element. Here it is provided for in accordance with the proposal to divide the shaft into a bottom and a top part by means of a separating tray. The separating tray is fitted above the inlet hole through which the raw water flows into the shaft. Provided for in the separating tray is a hole through which the water that has flowed in can pass into the top part of the shaft. However, a rising pipe is connected to this hole from above so that the water above the separating tray cannot spread over the whole cross-sectional surface of the shaft straightaway but first has to rise inside the rising pipe as far as an outlet that is provided for in the rising pipe at a distance above the separating tray. Disposed inside the rising pipe is a spiral element surrounding a closed core. So, on the one hand, the rising water is forced by the spiral element to rotate and, on the other, it cannot straightaway rise in a vertical direction and shoot through the rising pipe but in the course of this upwardly directed movement runs up against the spiral element from below.

[0010] The water running into the shaft is calmed first in a calming chamber underneath the separating tray and further calmed again when the water rises inside the rising pipe so that overall the particles are effectively separated by the calming of the water and so that accordingly water from which some particles have already been removed runs out of the rising pipe.

[0011] It is provided for in accordance with the proposal to dispose radially in a top part of the shaft and outside the rising pipe an additional chamber that entirely surrounds the rising pipe and is referred to as an annular chamber. Here the annular chamber can extend all the way around the rising pipe in the manner of a closed ring or extend around only a part of the rising pipe, for example, for about 270°, in the manner of an open ring so that in the remaining chamber not taken up by the annular chamber next to the rising pipe, if required, further internal fittings can be accommodated in the shaft. The annular chamber serves as a further calming chamber for the water and so as a further sedimentation stage to further clean the already pre-cleaned water. The annular chamber is fluid-permeably connected to the outlet hole of the shaft so that after passing through the annular chamber the now cleaned water can flow out of the shaft.

[0012] The series of sedimentation stages provided for in this example embodiment ensure that the water conducted through the shaft is well cleaned; the cleaning performance of the water conducted through the shaft can be determined by comparing a standardised particle level in the inflowing water with the quantity of particles that are carried in the water flowing out of the shaft. By dispensing with filtration stages inside the shaft the shaft in this example embodiment is not operated as a fitration shaft but purely as a sedimentation shaft. A larger quantity of water can therefore be conducted through the shaft per time unit so that the sedimentation shaft has a higher hydraulic capacity compared with a filtration shaft but, as is to be expected, a lower cleaning capacity compared with a filtration shaft.

[0013] A sedimentation shaft of this kind can therefore be used, for example, to drain water from especially large surfaces on which a correspondingly large quantity of particle-laden surface water collects. Or in addition to one or more filtration shafts a sedimentation shaft of this kind can be assigned to a specific surface to be drained of water and serve as a kind of overflow: if in cases of very heavy precipitation the hydraulic capacity of the filtration shaft is exhausted and additional quantities of water have to be conducted away, these additional quantities of water can be conducted into the sedimentation shaft so that the hydraulic capacity can be considerably increased when draining water from the specified surface. In contrast to a pure emergency overflow or a short-cut the water is not let out untreated in any way but is subjected to cleaning treatment that removes particles from the water by means of the sedimentation shaft.

[0014] It can be advantageously provided for for the outlet hole to open out so far above the separating tray that sufficient space remains below the outlet hole and above the separating tray to create between the separating tray and the outlet hole an especially flow-calmed area in which the sediments can collect. In this way a high-performing sedimentation shaft can be created.

[0015] It can be economically advantageously provided for to enable the shaft to be used optionally as a pure sedimentation shaft or as a filtration shaft. If the outlet hole as mentioned above opens out above the separating tray, the unmodified structure of the shaft can be used optionally with or without filtration material. The filtration material may be accommodated in the area between the separating tray and the outlet hole. A separating screen can then preferably be provided for between the filtration material and the outlet hole in order to retain the filtration material in the shaft and enable the filtered water to flow to the outlet hole.

[0016] By being able to use the shaft optionally as a sedimentation shaft or a filtration shaft not only can the manufacturer manufacture and store the shaft more easily but in particular the building client can either early on during construction planning or possibly even later, during the use phase of the shaft, also change the way in which the water is treated without having to purchase and install new shafts for the purpose.

[0017] It can be advantageously provided for to dispose in the bottom part of the shaft, that is, underneath the separating tray and also underneath the inlet hole, a downward-tapering funnel. The funnel serves to collect inside the bottom part of the shaft particles that settle in this calming chamber.

[0018] Here it can be advantageously provided for for the funnel to be disposed at a distance above the bottom of the shaft and to be open at the bottom so that particles that have collected in the funnel can pass out of the bottom of the funnel and into the intermediate chamber between the funnel and the bottom of the shaft, which accordingly forms a sludge trap for these particles. The funnel shape ensures that as far as possible none of these particles that have collected in the sludge trap can rise back out of this sludge trap and so negatively affect the cleaning action of the shaft.

[0019] It can further be advantageously provided for for the inlet hole that conducts the raw water into the shaft to be disposed so as to conduct the raw water into the funnel tangentially. In this way swirls are avoided and a higher level of sedimentation or cleaning enabled so that pre-cleaning of the raw water aimed for with the funnel can be achieved as effectively as possible.

[0020] The shaft can advantageously ensure that the raw water can even be cleaned as effectively as possible in cases of very heavy precipitation, even if the shaft is constructed as a filtration shaft. Here it must be borne in mind that the great quantity of water flowing into the shaft during a time unit must be conducted out of the shaft within an equal time unit to prevent the shaft from becoming overloaded. This can be advantageously achieved by providing for a so-called reserve in the filter surface. What is meant by reserve here is a section of the filter that is not constantly flowed through by water so that its hydraulic capacity is retained for longer than the filter surface that is mainly used and because of its filtering action becomes gradually loaded with particles that have been retained by the filter.

[0021] This reserve is disposed as an area of filter enclosed in its own housing so that water running out of the rising pipe cannot pass straight into the area of this reserve. This is achieved by placing the inlet hole of the reserve higher up than the outlet hole of the rising pipe so that, when the shaft is in normal operation, the water runs out of the rising pipe and cannot flow into the reserve. Only if the fluid level in the shaft rises above the outlet hole of the rising pipe can water flow into the reserve.

[0022] Water filtered by the reserve runs through an outlet hole in the housing of the reserve to the outlet hole of the shaft so that a hydraulic connection to the remaining filter area outside the reserve is created by this outlet hole in the shaft. However, when the shaft is in normal operation, only water that has already been filtered can run into the reserve through this connection to the remaining filter area. Because of this in normal filtration operation, if the reserve is not used, the reserve is not loaded with particles to any appreciable extent.

[0023] When the shaft is in normal operation, therefore, the hydraulic capacity of the reserve is not impaired, so that the reserve is in the aforementioned cases of very heavy precipitation ready to increase the performance capability of the shaft. This increase is achieved not only because the reserve cut in causes the filtration surface to be enlarged but also because the hydraulic capacity of the reserve is higher than that of an equal-sized section of the remaining filter surface.

[0024] A spiral element with a number of spiral ducts can advantageously be disposed in the rising pipe so that the calming and separating effect that is aimed for with the spiral and by which particles are deposited on the spiral ducts is increased.

[0025] The intake capacity of the outlet hole is advantageously designed so that all the water running into the shaft through the inlet hole can be conducted away through the outlet hole without the water level inside the shaft rising. Accordingly the cross-section of the outlet hole that can be freely flowed through is made as large or preferably larger than the cross-section of the inlet hole that can be freely flowed through. It can be provided for, for example, for the diameter of a pipe forming the outlet hole to be made at least as large as or larger than the diameter of a pipe forming the inlet hole.

[0026] The shaft can during operation as a pure sedimentation shaft, without filtration material, advantageously enable the raw water to be cleaned as effectively as possible by holding back lightweight materials and substances floating on the surface of the water. For this purpose the bottom edge of a housing that is open at the bottom can be disposed in the direction of flow and upstream of the outlet hole further down than the bottom edge of the outlet hole. The bottom edge of the aforementioned housing accordingly forms a so-called downflow baffle. The housing can, for example, be disposed in the shaft chamber remaining outside the rising pipe, for example, in an annular chamber remaining around a centrally disposed rising pipe like a ring. If the water is at a level above the bottom edge of the outlet hole, lightweight materials and substances are held back by the housing, while inside the housing water can rise as far as the outlet hole and flow away out of the sedimentation shaft.

[0027] If it is provided for to also enable the shaft to be used optionally as a filtration shaft and to construct the shaft correspondingly so that it can be operated optionally as a sedimentation or a filtration shaft, the housing may be used for different purposes: If operated purely as a sedimentation shaft, the housing forms the downflow baffle and is used as a lightweight-material and -substance separator. If operated as a filtration shaft, it accommodates the aforementioned filtration material and forms the aforementioned reserve.

[0028] For operation purely as a sedimentation shaft it may be sufficient to make the housing only high enough for the upper edge of the housing to lie just above the upper edge of the outlet hole so that the water level inside the sedimentation shaft, which will of course never rise above the level of the upper edge of the outlet hole, lies at the level of the housing. However, if it is provided for to also construct the shaft optionally for operation with filtration material, the housing may extend upward considerably above the upper edge of the outlet hole. To use the shaft as a filtration shaft, the shaft may advantageously incorporate the features explained in the following:

[0029] In the shaft, for example, in the aforementioned annular shaft, the filtration material is disposed upstream of the outlet hole so that – viewed in the direction of water flow – it is positioned upstream of the outlet hole and accordingly the water has to pass through the filtration material before flowing to the outlet hole.

[0030] It can be advantageously provided for here for the filtration material to lie against a fleece mat that extends at least part way up the filtration material. The fleece mat enables the inflowing water to be distributed all the way up the filtration material and so supports a high hydraulic capacity of the shaft. It can be especially advantageously provided for for the fleece mat to extend all the way up the filtration material. And it can be especially advantageously provided for for the fleece mat to be constructed in a number of layers so that, if a commercially available fleece material is used, a fleece mat of a considerably greater thickness is created that provides a high hydraulic capacity, that is, can be flowed through by a large quantity of water per time unit.

[0031] That the fleece mat is seated against the filtration material is important for the desired distribution of water over a large part of the filtration material. The fleece mat can, for example, be arranged midway along the filtration material, viewed in a radial direction, or radially right inside, seated up against the rising pipe.The fleece mat can be especially advantageously disposed between the filtration material and the wall of the shaft, that is, radially right outside in the filtration chamber, so that the fleece mat can take up as large a surface as possible and so provide an optimum hydraulic capacity.

[0032] The filtration material may be advantageously disposed above the outlet hole. In this way a gravity-assisted flow through the filtration material is ensured. In this way a collecting chamber for the filtered water can also be created underneath the filtration material. In this collection chamber the filtered water emerging from the filtration material at very different points can be collected and then without resistance from the filtration material flow to the outlet hole. In this way the filtered water is guaranteed to flow away to the outlet hole fast and the hydraulic capacity of the shaft is increased.

[0033] A drainage pipe that connects to the outlet hole can be advantageously disposed downstream of the filtration material and upstream of the outlet hole. Accordingly the drainage pipe can work like the aforementioned collecting chamber.

[0034] Example embodiments of the invention are explained in greater detail in the following with the aid of purely schematic, non-scale drawings. Shown are in

Fig. 1 a vertical section along line I - I of fig. 3 through a shaft constructed as a filtration shaft,

Fig.2 a vertical section through the same filtration shaft along the line II - II in fig. 3,

Fig. 3 a cross-section through the filtration shaft in Figs. 1 and 2, and

Fig. 4 a vertical section similar to fig. 2 through a shaft constructed as a sedimentation shaft.

[0035] In each drawing 1 refers to a shaft as a whole that incorporates an inlet hole 2 with a first diameter for untreated raw water and an outlet hole 3 for treated water. The outlet hole 3 incorporates a second, larger diameter than the inlet hole 2. Disposed underneath the inlet hole 2 is a funnel 4, the inlet hole 2 being constructed as a pipe section and conducting the raw water into the funnel 4 tangentially by means of a pipe bend. The funnel 4 incorporates at the top so large a diameter that it extends over the whole cross-sectional surface of the shaft 1. The funnel 4 is disposed with its bottom end at a distance above a bottom plate 5 of the shaft 1, and because the funnel 4 is open at the bottom, particles sedimented in the funnel can pass through the bottom end of the funnel 4 into a chamber that is referred to as a sludge trap 6.

[0036] The bottom part of the shaft 1 serves to pre-clean the raw water by calming the water and sedimentation of the particles. This bottom part is separated from the top part of the shaft 1 by a separating tray 7 that extends above the inlet hole 2. The separating tray 7 is constructed as an annular plate and incorporates in its centre a hole 8 through which water can rise above the separating tray 7. Running upwards from the hole 8 is a rising pipe 9, the rising pipe being open at the top so that it incorporates at a distance above the separating tray 7 its outlet 10, through which the water runs out of the rising pipe 9.

[0037] Disposed inside the rising pipe 9 is a spiral element 11 incorporating a number of ducts so that the water that rises in the rising pipe 9 is conducted through and calmed by the spiral element 11. Through this calming particles are deposited on the spiral element 11, so creating in the rising pipe 9 a second pre-cleaning stage. The spiral element 11 here runs around an inner pipe 12 and connects fluid-tightly to both the rising pipe 9 and the inner pipe 12, which thus forms a closed core for the spiral element 11.

[0038] The pre-cleaned water runs out of the rising pipe 9 into an annular chamber 14 that extends around the outside of the rising pipe 9 and to which a filtration material 15 is assigned. Outside, seated against the wall of the sedimentation shaft 1, the filtration chamber 14 is delimited by a multi-layered fleece mat 16, so facilitating distribution of the inflowing water all the way up the filtration material 15. Disposed between the filtration material 15 and the outlet hole 3 is a separating screen 17: the filtration chamber 14 is delimited downwards by the separating screen 17, so that the filtered water runs out of the filtration material 15, through the separating screen 17 and into a collecting chamber 18, which is filled with a granulate and in which a drainage pipe 19 connects to the outlet hole 3.

[0039] In the example embodiment in figs. 1 to 3 the shaft 1 is constructed as a filtration shaft. Disposed in the annular chamber 14 is a filtration material 15. Outside, seated against the wall of the sedimentation shaft 1, the filtration chamber 14 is delimited by a multi-layered fleece mat 16, so facilitating distribution of the inflowing water al the way up the filtration material 15. The filtration chamber 14 is delimited downwards by a separating screen 17, so that the filtered water runs out of the filtration material 15, through the separating screen 17 and into a collecting chamber 18, which is filled with a granulate and in which a drainage pipe 19 runs to the outlet hole 3.

[0040] Disposed geodetically higher than the upper end of the rising pipe 9 is an inlet hole 20 of a so-called reserve 21, that is, an area that is separated from the remaining annular chamber 14. The reserve 21 incorporates its own housing, which is formed, on the one hand, by a circumferential section of the wall of the shaft 1 and, on the other, by a pipe segment 22 that is attached inside to the wall of the shaft 1.

[0041] In the example embodiment in figs. 1 to 3, in which the shaft 1 is constructed as a filtration shaft, the reserve 21 is likewise filled with filtration material 15.

[0042] The filtration material 15 may contain, for example, mineral filtration components such as sand, gravel, etc. However, the filtration material 15 may also enable the water to be effectively biologically treated, if the filtration material 15 contains biologically active material, for example, microorganisms. Through the separating screen 17, which delimits the reserve 21 downwards, treated water that has flowed through the filtration material 15 has flowed out of the annular chamber 14 into the drainage pipe 19 and is underneath the housing of the reserve 21 can rise upward into the reserve 21. In the case of a biologically effective filtration material 15 good living conditions are therefore always guaranteed for the mocroorganisms and these microorganisms are protected, for example, from drying out.

[0043] It is to be observed in practice that the filtration material 15 shows a decreasing hydraulic capacity over time, because through filtration it enriches itself with particles and so gradually becomes less and less easy to flow through. In cases of very heavy precipitation the situation may therefore arise that the inflowing water quantity cannot run into the drainage pipe 19 from the annular chamber 14 fast enough. In such a case the water level inside the shaft 1 rises above the annular chamber 14 until it reaches the level of the inlet hole 20 of the reserve 21. The water then also flows into the reserve 21, so that not only is the whole surface available for filtration enlarged but in particular also a filtration area is provided that, being less frequently used, is less loaded with filtration particles and shows a correspondingly higher hydraulic capacity than a comparably sized quantity of filtration material 15 in the annular chamber 14.

[0044] In the example embodiment in fig. 4 the shaft 1 is constructed as a sedimentation shaft. The outlet hole 3 in this embodiment in Fig. 4 opens out in the shaft 1 at a distance above the separating tray 7, particularly in the annular chamber 14 of the shaft 1. This distance is first of all aimed at creating underneath the outlet hole 3 a sedimentation chamber in which, as in the sludge trap 6, sediments are collected that have settled downwards out of the water in the annular chamber 14. Furthermore, the distance between the separating tray 7 and the outlet hole 3 in conjunction with the disposition of the pipe segment 22 serves to separate out lightweight materials and substances, such as oil, that are floating on the water inside the annular chamber 14. A bottom edge 23 of the pipe segment 22 is for this purpose disposed lower down than the outlet hole 3 but at a distance above the separating tray 7, so that the pipe segment 22 forms a downflow baffle: water can rise out of the area underneath the pipe segment 22 into the reserve 21 as far as the outlet hole 3 and then leave the shaft 1, while lightweight materials and substances floating on the surface in shaft 1 are held back by the pipe segment 22 and cannot pass into the outlet hole 3.

[0045] For the pipe segment 22 to work as a separator of lightweight materials and substances it can be sufficient for the pipe segment 22 to be higher than the upper edge of the outlet hole 3. Assuming that the intake capacity of the outlet hole 3 is sufficient to prevent the level of the water in the sedimentation shaft 1 from rising, a short pipe segment 22 of this kind can also prevent lightweight materials and substances floating on the water from passing into the outlet hole 3.

[0046] However, the height of the pipe segment 22 shown on the drawing takes into account that the shaft 1 can be operated not only as a sedimentation shaft but also, if necessary, as a filtration shaft, if filtration material is disposed in the annular chamber 14 and in the reserve 21. The otherwise unchanged design of the sedimentation shaft 1 shown in fig. 4 may be supplemented for this purpose by, for example, the components of the filtration shaft in accordance with figs. 1 to 3, that is, by the multi-layered fleece mat 16 that is disposed on the outer wall of the shaft 1 and inside the annular chamber 14, and by a separating screen 17 fitted above the outlet hole 3 so as to hold back the filtration material.

[0047] These internal components fitted into the sedimentation shaft 1 but not shown in fig. 4 can be standardly included in shaft 1 to enable the user to use the shaft 1 optionally as a sedimentation shaft or as a filter shaft. These internal fittings serve during operation as a pure sedimentation shaft for additionally calming the water flow and accordingly increase the sedimentation or treatment performance of the sedimentation shaft 1. For use of the shaft 1 as a filtration shaft filtration material 15 need only be added into the annular chamber 14 and into the reserve 21.

[0048] In the example embodiments shown it is provided for for the inner pipe 12 inside the spiral element 11 to be sealed to prevent water from entering, that is, to be closed at one or both ends. In deviation from the example embodiment shown, however, it may be provided for for the inner pipe 12 to form an overload protection for the shaft 1 in case the hydraulic capacity of the shaft 1 is impaired and the level inside the shaft 1 rises. In such a case it may be provided for for the upper end of the inner pipe 12 to be left open so that water can flow into the inner pipe 12 from above. It is further provided for in such a case for the inner pipe 12 to be connected in its bottom part to the outlet hole 3 so that water that has flowed into the inner pipe 12 from above can run into the outlet hole 3. Here it is important that underneath this connection between the inner pipe 12 and the outlet hole 3 the inner pipe 12 is closed, so that, when the sedimentation shaft 1 is in normal operation, no water can short-cut past the spiral element 11 and into the outlet hole 3.

[0049] If the inner pipe 12 is required to perform the function of a short-cut protection or overload protection in this way, the upper end of the inner pipe 12 can be disposed geodetically higher up than the inlet hole 20 of the reserve 21. In this way behaviour of the shaft 1 that differs in three stages is achieved: during normal operation water runs out of the spiral element 11 of the rising pipe 9 and into the annular chamber 14. In cases of very heavy precipitation the water level inside the shaft 1 rises so that water flows through the inlet hole 20 and also into the reserve 21. In the third stage, in cases of especially heavy precipitation, water above the level of the reserve 21 can pass into the inner pipe 12 so that this water can then take a short-cut straight into the outlet hole 3.

Reference signs

[0050]

1	Shaft
2	Inlet hole
3	Outlet hole
4	Funnel
5	Bottom plate
6	Sludge trap
7	Separating tray
8	Hole
9	Rising pipe
10	Outlet
11	Spiral element
12	Inner pipe
14	Annular chamber
15	Filtration material
16	Fleece mat, multi-layered
17	Separating screen
18	Collecting chamber
19	Drainage pipe
20	Inlet hole
21	Reserve
22	Pipe segment
23	Bottom edge

PATENTKRAV

1. Skakt (1) med en indstrømningsåbning (2) til urenset råvand, en udstrømningsåbning (3) til renset vand og et mellem indstrømningsåbningen (2) og udstrømningsåbningen (3) anbragt beroligelsesrum, der omfatter en afsættelsesflade til partikler indeholdt i råvandet, hvor der over indstrømningsåbningen (2) er anbragt en separationsbund (7) i skakten (1), hvor separationsbunden (7) omfatter en åbning (8), som et stigrør (9), som i en afstand over separationsbunden (7) omfatter et udløb (10), opadtil støder op til **kendetegnet ved, at** der i stigrøret (9) er anbragt en spiral (11), som cirkulerer om en lukket kerne således, at råvand, som er strømmet ind i skakten (1), i spiralgangen kan stige ud opad via separationsbunden (7), hvor der over separationsbunden (7) radialt uden for stigrøret (9) er anbragt et ringkammer (14) således, at vand, som er strømmet ud af udløbet (10) i stigrøret (9), kommer ind i ringkammeret (14), og hvor ringkammeret (14) fluidgennemtrængeligt støder op til udstrømningsåbningen (3) i skakten (1) således, at renset vand strømmer ud af ringkammeret (14) til udstrømningsåbningen (3).

2. Skakt ifølge krav 1, **kendetegnet ved, at** der under indstrømningsåbningen (2) er anbragt en tragt (4), som indsnævres nedadtil.

3. Skakt ifølge krav 2, **kendetegnet ved, at** tragten (4) er anbragt i afstand over en bund (5) i skakten (1), og tragten (4) er åben nedadtil således, at der under tragten (4) i skakten (1) er dannet et slamfang (6) til partikler, som strømmer ud af tragten (4) nedadtil.

4. Skakt ifølge krav 2, **kendetegnet ved, at** indstrømningsåbningen (2) er anbragt, så at den tangentielt fører råvandet ind i tragten (4).

5. Skakt ifølge et af de foregående krav, **kendetegnet ved, at** rummet radialt uden for stigrøret (9) er inddelt i to områder, som hvert især kan gennemstrømmes oppefra og nedad af vand, som strømmer ud af udløbet (10) i stigrøret (9), og fluidgennemtrængeligt støder op til udstrømningsåbningen (3) i skakten (1), hvor der ud over ringkammeret (14) er anbragt et som reserve (21) betegnet område i sit eget hus, som omfatter en indløbsåbning (20) og en med udstrømningsåbningen (3) kommunikerende udløbsåbning, hvor indløbsåbningen (20) i reserven (21) geodætisk ligger højere end udløbet (10) i stigrøret (9).

6. Skakt ifølge et af de foregående krav, **kendetegnet ved, at** der foran udstrømningsåbningen (3) i vandets strømningsretning er indskudt en væg, hvis underkant (23) geodætisk ligger dybere end udstrømningsåbningen (3), og som strækker sig mindst lige så langt opad som udstrømningsåbningen (3).

7. Skakt ifølge kravene 5 og 6, **kendetegnet ved, at** huset i reserven (21) danner væggen, som omfatter underkanten (23),

8. Skakt ifølge et af de foregående krav, **kendetegnet ved, at** der i stigrøret (9) er anbragt en spiral (11) med flere spiralgange.

9. Skakt ifølge et af de foregående krav, **kendetegnet ved, at** der i ringrummet (14) er anbragt et filtermateriale (16), som i vandets strømningsretning er indskudt foran udstrømningsåbningen (3).

10. Skakt ifølge krav 9, **kendetegnet ved, at** filtermaterialet (15) støder op til en fibermåtte (16), som strækker sig mindst over en del af filtermaterialets højde.

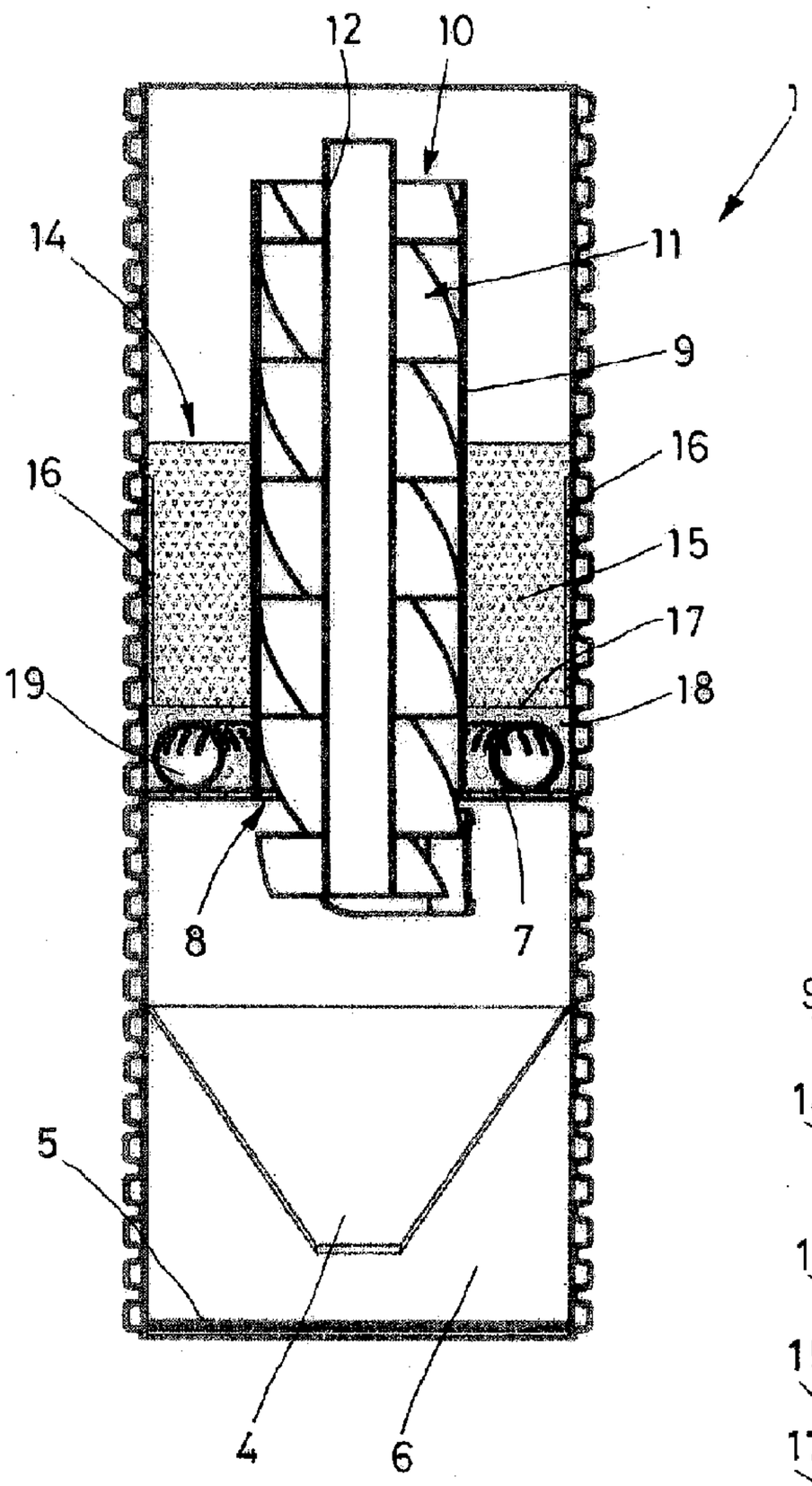
11. Skakt ifølge krav 9 eller 10, **kendetegnet ved, at** fibermåtten (16) er anbragt mellem filtermaterialet (15) og væggen i skakten (1).

12. Skakt ifølge et af kravene 9 til 11, **kendetegnet ved, at** filermaterialet (15) er anbragt over udstrømningsåbningen (3).

13. Skakt ifølge krav 12, **kendetegnet ved, at** der mellem filtermaterialet (15) og udstrømningsåbningen (3) er anbragt en separationssigte (17).

14. Skakt ifølge et af kravene 9 til 13, **kendetegnet ved, at** der nedstrøms fra filtermaterialet (15) og opstrøms fra udstrømningsåbningen (3) er anbragt et dræningsrør, som støder op til udstrømningsåbningen (3).

FIG.1


12
10
14
11
9
16
16
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18
8
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4
6

FIG.2

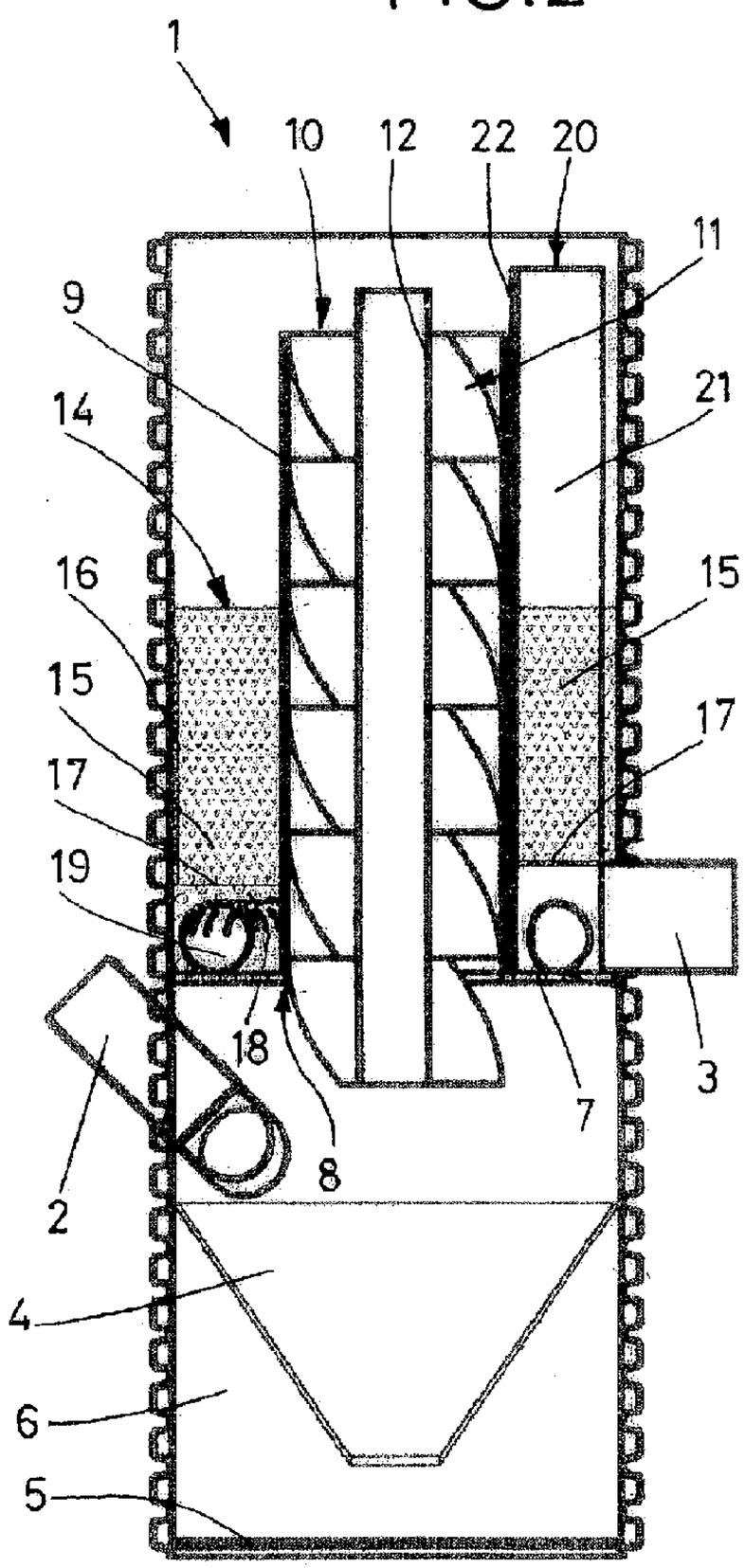
1
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FIG.3

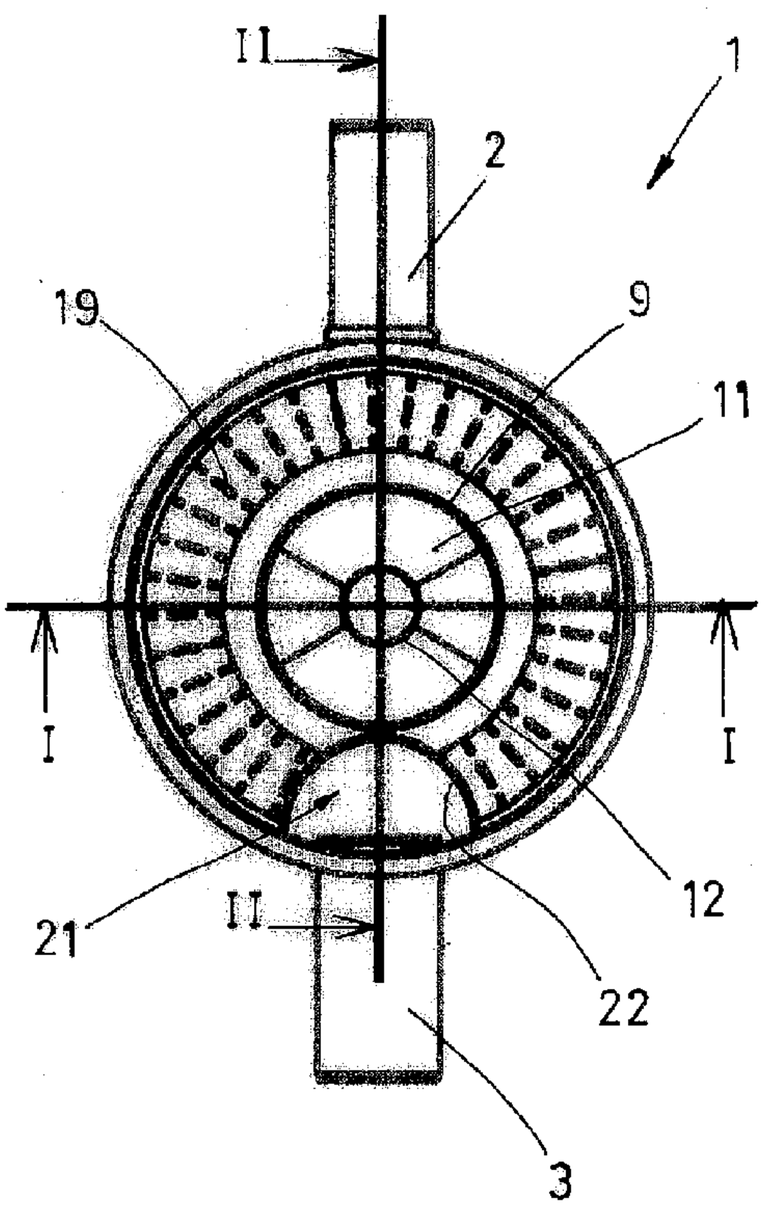

FIG.4