In a rotary brush screen at an overflow sill of a rainwater relief system, comprising screen bars extending transverse to the overflow sill and strippers engaging in the screen bars in a comb-like manner, the strippers are put into a curvilinearly extending, circling movement via a crank drive in accordance with the invention by means of an actuating lever in cooperation with a stationary support bearing, due to which circling movement the strippers are guided from above into the spaces between the screen bars and out again at the bottom of the overflow sill. The risk of the discharge of solids into the waters as a result of a mechanical influence on the solids during the stripping operation is reduced thereby and the operational safety is increased.
This invention relates to a rotary brush screen at an overflow sill of a rainwater relief system as defined in the generic part of claim 1.

Rotary brush screens of this type usually are employed at overflow sills of rainwater relief structures of the waste water canalisation, so that in the case of precipitation events the discharge of the solids entrained in the waste water, such as e.g. lumps of faeces, toilet paper, sanitary articles or the like, into the waters is prevented. The solids retained at the screen bars are to be recirculated into the stream of waste water flowing on to the clarification plant.

From DE 44 38 716, a rotary brush screen as mentioned above has become known.

Such rotary brush screens are characterized by a simple, robust and compact construction, whose use is particularly beneficial under conditions of limited space and thus is quite suitable for retrofitting.

They consist of a screen grid arranged at the overflow sill, comprising screen bars, ropes or the like extending transverse to the overflow sill and directed upwards from the overflow sill, into whose spaces comb-like strippers are swivelled to and fro via a lever mechanism proceeding from a crank drive. With each swivel movement, the solids adhering to the screen bars are delivered by the strippers to the terminal regions of the screen bars, where they should be detached from the strippers at the screen bars and then sink into the stream of waste water flowing to the clarification plant.

However, this involves the problem that in particular the solids stripped off from the strippers upwards and against the outflow stream and thereby formed to lumps are immediately washed up against the screen bars with the suction of the overflow stream after the reversal point of the swivel movement. Due to the agglomerated solids pressed into the spaces between the screen bars by the flow pressure of the overflow stream, the stripping resistance at the screen bars is increased. With increasing operating period and with necessarily increasing solid accumulations the stripping resistance can become so large that the function of the rotary brush screen comes to a standstill.

In addition, it is disadvantageous that due to the above-mentioned problem the stripped solids necessarily repeatedly undergo a stripping operation and thus are squeezed and crushed as a result of the mechanical influences of the strippers at the screen bars and under the pressure of the overflow stream and thereby get into the waters in comminuted form.

In particular when solids of plastic material, such as sanitary articles, wind around the strippers and/or the screen bars, the risk of jamming at the screen bars is particularly large when the strippers undergo a scissor-like swivel movement into the spaces between the screen bars.

Furthermore, it is disadvantageous that at the reversal points of the stripper swivel movement it is not possible to completely liberate the agglomerated solids from the strippers. As a result, tressings are formed at the strippers, which no longer are detached on their own and thereby likewise lead to increased frictional resistances at the screen bars, which cause malfunctions and/or result in an increased maintenance effort.

Therefore, it is the object underlying the invention to create a rotary brush screen of the type mentioned above, in which the risk of the discharge of solids into the waters as a result of mechanical influences on the solids is reduced during the stripping operation and the operational safety is increased.

The solution of this object is effected according to the characterizing features of claim 1; particular aspects of the invention are subject-matter of the characterizing features in the sub-claims.

The advantage of the rotary brush screen of the invention primarily consists in avoiding the above-mentioned disadvantages.

During the stripping operation, the solids retained at the screen bars are exclusively stripped off via a downwardly directed movement and thereby in a gentle form, as a result of the circling kinematics of the strippers in accordance with the invention.

For detaching the solid accumulations from the strippers in the lower region of the screen bars, an almost linear lead-out of the strippers with the overflow stream out of the spaces between the screen bars is effected, which is directed towards the relief side. After each stripping operation, the strippers therefore are completely and gently liberated from the solids at the screen bars, without allowing the occurrence of a scissor-like squeezing of the solids or of a jamming of the strippers at the screen bars.

Due to the stripper kinematics in accordance with the invention, the above-mentioned detachment of the solids from the strippers is also made possible below the overflow sill level. The solids detached there can thereby be collected for example in a collecting pan walled off against the suction of the overflow stream and after the end of the relief event can be recirculated into the outflow stream to the clarification plant.

The rotary brush screen of the invention involves the particular advantage that in the case of a blockage of the strippers at the screen bars, for example as a result of an extreme accumulation of solids or due to seized solid parts, the same can be removed again on its own.

If a blockage as described above occurs while the screen bars comb through, the strippers get stuck at the blockage, and at the same time the actuating lever is lifted from the support bearing since the crank drive still rotates undisturbed, and necessarily is moved back in the direction of the crank drive.

When the stripper comb is pulled away from the blockage as a result of this movement, the stripper comb will abruptly fall down under its own weight, until the actuating lever connected therewith again impinges on the support bearing. Due to the force thus generated by the stripper comb abruptly falling down, the solids responsible for the blockage are pushed out of the spaces between the screen bars and back into the inflow stream of the overflow water, whereby the blockage is removed.

During the stripping operation, the overflow stream directed onto the strippers or their carrier element supportingly acts on the crank drive as a driving force and thereby offers spatial and constructional advantages in particular in a water wheel drive, because the water wheel can be made more compact or smaller due to this power assistance.

A particular problem in the retention of solids generally are accumulations of fat, which in general are introduced into the canalisation via kitchen waste waters, then
cool down and grow to lumps. Since fat is lighter than water, the fat-containing lumps ascend again after the stripping operation and then are immediately sucked against the screen bars by the overflow stream. With a correspondingly high amount of fat, the same can thus agglutinate the spaces between the screen bars, which results in an increased maintenance effort or can even lead to the failure of the screen device.

[0021] Due to the kinematics of the stripper movement in accordance with the invention, in which the strippers are guided to below the level of the overflow sill to detach the screenings and are then almost linearly guided out of the spaces between the screen bars towards the overflow sill, a further aspect of the invention provides a pivotally mounted, preferably floatable covering hood for topside closure of an optional collecting space.

[0022] In operation, the covering hood preferably arranged before and towards the overflow sill at the level of the upper edge of the overflow sill blocks a strip of water extending parallel to the overflow sill from flowing through up against the screen bars; especially when the covering hood forms the upper closure of a collecting space, such as that of a collecting pan.

[0023] When combing through the screen bars, the strippers impinge on the covering hood on the side facing the screen bars and swivel the same downwards. There is formed a gap between the covering hood and the screen bars, through which the screenings are pushed under the covering hood. In this operating phase, the strippers are motionally connected with the covering hood as a result of the touch contact and together form a barrier against the stripped and possibly ascending solids. When the strippers again move away from the covering hood during the further movement, the same automatically swivels upwards again into the starting position, without producing an outlet opening for the stripped screenings. Swivelling back the covering hood automatically and in a linked movement is accomplished by the covering hood constituting a floating body and/or by means of a counter-weight.

[0024] The screenings thus collected under the covering hood are prevented from floating and are recirculated into the stream of waste water running to the clarification plant with the falling water level only after the end of the relief event.

[0025] Instead of a collecting pan with bottomside folding bottom, a collecting space for the screenings, which is open at the bottom and enclosed by a kind of plunging wall, is also conceivable. In smaller plants, for example, the collecting space can also be formed exclusively from the covering hood.

[0026] Further features, details and advantages of the invention will subsequently be explained in detail with reference to embodiments illustrated in the drawing, in which:

[0027] FIG. 1: shows a vertical section through the rainwater relief system and the rotary brush screen transverse to the overflow sill.

[0028] FIG. 2: shows a top view of the rotary brush screen as shown in FIG. 1 as a horizontal section through the rainwater relief system.

[0029] FIG. 3: shows an enlarged representation of the rotary brush screen in a top view.

[0030] FIG. 4: shows an enlarged representation of the rotary brush screen in a vertical section with strippers guided in the spaces between the screen bars.

[0031] FIG. 5: shows an enlarged representation of the rotary brush screen in a vertical section with the strippers guided outside the screen bars.

[0032] FIG. 6: shows a detail of a stripper with enlarged contour in a vertical view.

[0033] FIG. 7: shows a top view with respect to FIG. 6.

[0034] FIG. 8: shows a detail of a rotary brush screen with stripper in accordance with a further embodiment in a first position.

[0035] FIG. 9: shows a detail according to FIG. 8 in a second position.

[0036] FIG. 10: shows a detail according to FIG. 8 in a third position.

[0037] FIG. 11: shows a detail according to FIG. 8 in a fourth position.

[0038] FIG. 12: shows a representation corresponding to FIG. 4 of the second embodiment corresponding to FIGS. 8 to 11.

[0039] FIG. 13: shows a representation corresponding to FIG. 3 of the second embodiment corresponding to FIGS. 8 to 11, and

[0040] FIG. 14: shows a representation corresponding to FIG. 5 of the second embodiment corresponding to FIGS. 8 to 11.

[0041] The drawings show a rotary brush screen 1 which is arranged at an overflow sill 21 of a rainwater relief system 20. The rainwater relief system 20 includes an inlet channel 22, an outlet channel 23 and a relief channel 24 leading to the preclarifier.

[0042] In the case of a precipitation event, the water level rises in the relief system 20 between the inlet channel 22 and the outlet channel 23. The quantities of water not absorbable by the clarification plant are drained into a body of water via the overflow sill 21 and thereby flow through the rotary brush screen 1 arranged at the overflow sill 21.

[0043] The rotary brush screen 1 preferably arranged in the upper region of the overflow sill 21 consists of a multitude of screen bars 2 or ropes arranged transverse to the overflow sill 21 and directed upwards proceeding from the overflow sill 21, at which the solids entrained in the overflow water are retained when flowing through the screen bars 2.

[0044] Before the side of the overflow sill 21 directed towards the relief channel 24, strippers 4 lined up like a comb are arranged on a carrier element 5, to which an actuating lever 6 is attached. The other end of the actuating lever 6 is pivotally connected with a crank drive 8, by means of which the strippers 4 in operation engage in the spaces 3 between the screen bars 2 in a comb-like manner.

[0045] Via a stationary support bearing 7 arranged in the vicinity of the actuating lever 6, the actuating lever 6 is contacted with the support bearing 7 by its own weight and the weight of the strippers 4, respectively. When the crank drive 8 rotates, the pivotally mounted actuating lever 6 at the stationary support bearing 7, which preferably constitutes a roller, is reciprocated in horizontal direction. At the same time, the actuating lever 6 is swivelled in vertical direction, whereby the end of the actuating lever 6 connected with the strippers 4 is put into a curvilinearly extending, circling movement.

[0046] In the upper region of the screen bars 2, the strippers 4 are guided into the spaces 3 between said screen bars opposite to the flow direction and in the lower region of the screen bars 2 are guided out again in flow direction.
[0047] For better clarity, FIG. 4 shows the kinematics of the rotary brush screen 1 in the phase with the strippers 4 guided in the spaces 3 between the screen bars 2. FIG. 5 shows the kinematics of the rotary brush screen 1 in the phase with the strippers 4 moved outside the screen bars 2.

[0048] By way of example, the individual components of the rotary brush screen 1, such as crank drive 8, actuating lever 6, support bearing 7, screen bars 2, etc., are connected with each other via a frame-like holder 19, which is attached to the wall surfaces of the rainwater relief system 20, and mounted in the same, respectively. For reasons of construction, the components such as the actuating lever 6 and the support bearing 7 are of course preferably arranged in pairs.

[0049] In accordance with the exemplary embodiment, FIG. 1 to FIG. 5 show an actuation of the rotary brush screen 1 by means of a water wheel 9 without any additional energy. Via a belt or chain drive 25, the rotary movement of a water wheel 9 is transmitted to the crank drive 8; a power transmission by means of an electric motor to the crank drive 8 is also possible.

[0050] With the inventive kinematics of the strippers 4, the contacting contour of actuating lever 6 and/or support bearing 7 preferably is formed as a control cam 18, which effects an almost linear movement of the strippers 4 towards the crank drive 8 and directed upwards at an angle, when the strippers 4 are guided out of the spaces 3 between the screen bars 2.

[0051] For collecting the solids stripped off towards the overflow sill 21, a collecting pan 10 preferably is provided in the crown region of the overflow sill 21, which in operation is closed laterally and from below. Due to the inertia of the water, the solids stripped off there remain in the pan liquid walled off and are not sucked towards the screen bars 2 along with the overflow stream. The collection of solids in the collecting pan 10 is particularly advantageous when the process of detachment of the solids from the strippers 4 is performed inside the collecting pan 10 and, because of the overflow stream, below the upper sill edge.

[0052] After the end of a relief event, a float-controlled folding bottom 11 on the bottom surface of the collecting pan 10 again releases the collected solids into the stream of waster water leading to the clarification plant.

[0053] For reasons of construction, the carrier element 5 guided via the actuating lever 6, and hence also the strippers 4, undergoes a slightly diverging lateral movement in longitudinal direction of the overflow sill 21. To prevent the strippers 4 from striking against the screen bars 2 or engaging in adjacent spaces 3 during engagement in the spaces 3 already with a lateral movement of only few millimeters, upon which the mechanism might block, a further aspect of the invention provides that, distributed along the length of the carrier element 5, a selected number of strippers 4a are arranged, which have a greater contour as compared to the remaining strippers 4.

[0054] For this purpose, guide elements 13 for the strippers 4a with the greater contour are arranged in a region where the strippers 4, 4a guided towards the screen bars 2 should again engage in the spaces 3 between the screen bars 2.

[0055] As seen in flow direction towards the overflow stream, the guide elements 13 preferably formed of a strip of sheet metal are provided with funnel-shaped guiding slots 15 towards the enlarged strippers 4a, in which the contours of the strippers 4a engage and in operation thus are necessarily aligned in their lateral movement.

[0056] For example, if a piece of wood or the like entrained in the waste water is seized between the screen bars 2 such that this prevents a further stripper movement, the loose connection between actuating lever 6 and support bearing 7 in accordance with the invention enables the strippers 4 to maintain their function up to the point of disturbance, although in restricted form, by automatically lifting the actuating lever 6 from the support bearing 7, without the entire apparatus thereby being put out of operation and possibly being damaged.

[0057] Extremely high amounts of overflow water caused by rare events of heavy rain can be discharged to the relief channel 24 via the upper end of the screen bars 2 in the form of an emergency overflow. To prevent the actuating lever 6 and the strippers 4, respectively, from being pulled up and thereby damaged by such great amounts of water, it is conceivable that turning over or extreme lifting of the actuating lever 6 from the support bearing 7 is prevented by a non-illustrated safety clamp arranged at the actuating lever 6 or at the support bearing 7.

[0058] FIGS. 8 to 14 show a further exemplary embodiment of an actuation of the rotary brush screen 1 by means of a water wheel 9 without any additional energy. This embodiment substantially corresponds to that of FIGS. 1 to 5. However, at the level of the upper edge of the overflow sill a covering hood 20 is provided before the overflow sill, which in operation blocks a strip of water extending parallel to the overflow sill from flowing through up against the screen bars 2. As shown in FIGS. 8 to 12, the covering hood 20 forms the upper closure of a collecting space 10, which in the embodiment is formed as a collecting pan 10. When combining through the screen bars, the strippers 6 impinge on the covering hood 20 on the side facing the screen bars 2 and swivel the same downwards about a swivel bearing 21. As shown in FIGS. 9 and 10, this creates a gap between the covering hood 20 and the screen bars 2, through which the screenings are pushed under the covering hood 20. In this operating phase, the strippers are motionally connected with the covering hood 20 as a result of the touch contact and together form a barrier against the stripped and possibly ascending solids. When the strippers again move away from the covering hood 20 during the further movement, the same automatically swings up again into the starting position (cf. FIG. 8), without an outlet opening being created for the stripped screenings. The automatic and motionally connected swivelling back of the covering hood is accomplished by the covering hood constituting a floating body and/or by means of a counter-weight 24 (cf. FIG. 11).

[0059] The screenings thus collected under the covering hood are prevented from floating out and are recirculated into the stream of waste water running to the clarification plant only after the end of the relief event with falling water level.

1. A rotary brush screen at an overflow sill of a rainwater relief system, comprising:

- screen bars extending transverse to the overflow sill, into whose spaces strippers are guided, which are actuated by a crank drive via a lever mechanism motionally connected with the crank drive,

wherein the lever mechanism includes an actuating lever and a stationary support bearing, wherein the actuating lever at one end is pivotally connected with the crank drive and at another end carries the strippers and cooperates with the support bearing such that when the crank
The rotary brush screen according to claim 1, wherein the actuating lever at the stationary support bearing is reciprocated in horizontal direction and at the same time swivelled in vertical direction, whereby the end of the actuating lever connected with the strippers is put into a curvilinearly extending, circling movement.

3. The rotary brush screen according to claim 1, wherein a contacting contour between actuating lever and support bearing constitutes a control cam.

4. The rotary brush screen according to claim 3, wherein that during the circling movement the strippers are guided into the spaces between the screen bars in an upper region thereof and are guided out of the spaces between the screen bars in a lower region thereof.

5. The rotary brush screen according to claim 4, wherein detachment of the solids from the strippers is effected below an upper edge of the overflow sill.

6. The rotary brush screen according to claim 5, wherein the strippers are again guided out of the spaces between the screen bars almost linearly.

7. The rotary brush screen according to claim 6, wherein for collecting stripped solids a collecting pan his arranged at the overflow sill.

8. The rotary brush screen according to claim 7, wherein distributed on a carrier element a certain number of strippers his arranged, which have a greater contour than remaining strippers.

9. The rotary brush screen according to claim 8, wherein for aligning the strippers guide elements are provided for the strippers with the greater contour.

10. The rotary brush screen according to claim 9, wherein the guide elements are arranged in a region where the strippers engage in the spaces between the screen bars.

11. The rotary brush screen according to claim 10, wherein the guide elements have a guiding slot extending in a funnel-shaped manner to the spaces between the screen bars.

12. A rotary brush screen at an overflow sill of a rainwater relief system, comprising:

- screen bars extending transverse to the overflow sill, into whose spaces strippers are guided, which are actuated by a crank drive via a lever mechanism motionally connected with the crank drive, wherein in a region before, towards and at the level of the overflow sill a pivotally mounted covering hood his provided, which covers a collecting space towards the top against the screen bars and which on the side facing the screen bars can be swivelled downwards by the strippers in a linked movement with the strippers.

13. The rotary brush screen according to claim 12, wherein the covering hood is of a floatable type and/or provided with a counter-weight.

14. A system comprising:

a rainwater relief system including an overflow sill;
a rotary brush screen positioned at the overflow sill;
screen bars extending transverse to the overflow sill, the screen bars including spaces;
strippers guided in the spaces,
a crank drive actuating the strippers via a lever mechanism motionally connected with the crank drive, the lever mechanism including an actuating lever and a stationary support bearing, wherein the actuating lever at one end is pivotally connected with the crank drive and at another end carries the strippers and cooperates with the support bearing, wherein the strippers generate a circling movement extending vertically and parallel to the screen bars via rotation of the crank drive.

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