The object of the invention is therefore to provide a device for the processing of water which is not subject to the drawbacks named above, and, in particular, even at low water pressures an adequate flow velocity leads to an effective killing of living creatures and organisms, in particular micro-organisms, without high amounts of energy having to be applied for this or additional substances which are environmentally harmful in part having to be used.

The object is attained according to ~~the invention by~~ a disclosed water treatment device comprising a water grinder and a pumping device, the water grinder having a rotor and a stator, the diameter d of which increases in the direction of flow towards the outlet, and the rotor and the stator forming an annular gap, characterized in that the toothing depth and the annular gap are reduced in the direction of flow towards the outlet, the annular gap at the outlet preferably has a width of from 2 µm to 20 µm, the rotor and the stator each have cross cut toothing on the surface which is arranged in opposite directions on the rotor and the stator, and the stator has a diffuser ring in the area of the outlet in place of the cross cut toothing.

In addition the object is attained by a process for water processing comprising at least the stages

a. entry of the water into a storage reservoir,

b. pumping of the water with a build-up of pressure to a pre-cleaning stage, preferably a filter,

c. physical / mechanical pre-cleaning of the water in the pre-cleaning stage,

d. treatment of the water in a water treatment device according to the invention, wherein the organisms present in the water are killed, and

e. transfer of the water into a further storage reservoir.

According to one aspect of the invention, there is provided a water treatment device comprising a water treatment grinder and a pumping device, where the water treatment grinder has a rotor and a stator, the diameter of which increases in the direction of flow towards the discharge opening, and where rotor and stator form an annulus, characterised in that the depth of engagement of the gears and the annulus become reduced in the direction of flow towards the discharge opening, the rotor and the stator each have a surface with cross cut gearing on the surface that runs in opposite directions on the rotor and the stator or a random surface pattern, and that the stator has a diffuser ring in the area of the discharge opening in place of the cross cut gearing or the random pattern.

According to another aspect of the invention, there is provided a process for water treatment comprising at least the stages: water entry into a storage reservoir, pumping of the water with a build-up of pressure to a physical/mechanical pre-cleaning stage, physical/mechanical pre-cleaning of the water in the pre-cleaning stage, treatment of the water in a water treatment device in accordance with the above aspect of the invention, when the organisms present in the water are killed, and water transfer into a further storage reservoir.

Further embodiments form the subject matter of the sub-claims or are described below.

The water treatment device according to the invention permits an effective killing of living creatures and micro-organisms, even at low water pressures. The organisms are ground mechanically or are damaged by the scraping or separation of the cell walls on the teeth of the rotor and stator in such a way that they die. In addition, a further killing is achieved by the cavitation at the outlet at the annular gap and the abrupt pressure release or implosion caused thereby.

Organisms are understood according to the invention as being the living creatures and micro-organisms which are present in water, in particular in sea water, such as for example algae, fungi, bacteria, single cell organisms, small fish, crustaceans and plankton organisms.

The water treatment device according to the invention has a water grinder comprising a rotor and a stator. The surfaces of both the rotor and the stator have cross cut or random toothing, preferably cross cut toothing. The toothing depth on the rotor is reduced preferably to zero in the direction of flow towards the outlet and on the stator preferably to zero in the direction of flow towards the diffusor ring. The number of teeth and the distance between the

Claims

1. Water treatment device ~~(1)~~ comprising a water treatment grinder ~~(2)~~ and a pumping device ~~(3)~~, where the water treatment grinder ~~(2)~~ has a rotor ~~(4)~~ and a stator ~~(5)~~, the diameter ~~d~~ of which increases in the direction of flow towards the discharge opening, and where rotor ~~(4)~~ and stator ~~(5)~~ form an annulus,

characterised in that

- the depth of engagement of the gears and the annulus ~~(8)~~ become reduced in the direction of flow towards the discharge opening ~~(9)~~,
- the rotor ~~(4)~~ and the stator ~~(5)~~ each have a surface with cross cut

gearing on the surface ~~(6,7)~~ that runs in opposite directions on the rotor ~~(4)~~ and the stator ~~(5)~~ or a random surface pattern ~~(6, 7)~~, and

- that the stator ~~(5)~~ has a diffuser ring ~~(10)~~ in the area of the discharge opening in place of the cross cut gearing or the random pattern.

2. Water treatment device ~~(1)~~ in accordance with Claim 1, characterised in that the diffuser ring ~~(10)~~ has a surface ~~(7)~~ with an embossed, random pattern, preferably in the form of point-like projections on the surface ~~(7)~~.

3. Water treatment device ~~(1)~~ in accordance with Claim 1 or 2, characterised in that the water treatment grinder ~~(2)~~ has a tear-off edge ~~(11)~~ after the annular gap ~~(8)~~.

4. Water treatment device ~~(1)~~ in accordance with one of the preceding claims, characterised in that the annular gap ~~(8)~~ has a width at its outlet ~~(9)~~ of 2 µm to 20 µm, preferably 2 µm to 10 µm.

5. Water treatment device ~~(1)~~ in accordance with one of the preceding Claims, characterised in that the stator ~~(5)~~ is fastened to a base plate by at least one means of attachment, where the stator ~~(5)~~ fastening on the base plate is such that the stator can slide in radial direction.

6. Water treatment device in accordance with one of the preceding Claims,

characterised in that the pumping device ~~(3)~~ is an external or internal pumping device or a combination of the two, preferably exclusively an internal pumping device.

7. Water treatment device ~~(1)~~ in accordance with Claim 6, characterised in that,

the internal pumping device consists of an impeller wheel ~~(12)~~ at the inlet and/or a discharge blade ~~(13)~~ at the outlet ~~(9)~~, where this discharge blade ~~(13)~~ extends over the periphery of the discharge plate ~~(14)~~.

8. Water treatment device ~~(1)~~ in accordance with one of the preceding Claims,

characterised in that, at the rotor ~~(4)~~ the depth of engagement of the gearing tapers to zero in the direction of flow towards the discharge opening ~~(9)~~

and/or, at the stator ~~(5)~~, tapers to zero in the direction of flow towards the diffuser ring.

9. Water treatment device in accordance with one of the preceding Claims,

characterised in that the rotor ~~(4)~~ has a drive shaft ~~(16)~~ and is driven by a drive motor, preferably an electric motor ~~(15)~~.

10. Process for water treatment comprising at least the stages

a. water entry into a storage reservoir,

b. pumping of the water with a build-up of pressure to a physical/mechanical pre-cleaning stage,

c. physical/mechanical pre-cleaning of the water in the pre-cleaning stage,

d. treatment of the water in a water treatment device in accordance with one of Claims 1 to 9, when the organisms present in the water are killed, and

e. water transfer into a further storage reservoir,

11. Process in accordance with Claim 10, characterised in that, in an additional stage **f.** preceding the water transfer (**e.**) into the storage reservoir, a physical, chemical and/or biological post-treatment process of the water takes place.

12. Process in accordance with one of Claims 10 or 11, characterised in that sea water, in preference ballast water, is treated.