Claims

1. Device for treating liquids by means of ozone, comprising a pipe (1) in which a main flow of the liquid is guided in a flow direction from an inlet (2) to an outlet (3), comprising an ozone feed point (4) at which ozone can be introduced in gas form into the main flow, and comprising at least two mixers (5a ... 5f) which are located downstream of the ozone feed point (4),
c h a r a c t e r i s e d in that the mixers (5a ... 5f) are arranged at a distance from one another, wherein at least one reaction zone (6a ... 6e) is formed between the mixers (5a ... 5f), and in that the mixers (5a ... 5f) are designed in such a way that they each dissolve only a portion of the ozone in the main flow that has been introduced in gas form.

2. Device according to claim 1, **c h a r a c t e r i s e d** in that the mixers are in each case static mixers without any movable parts.

3. Device according to any one of the preceding claims,
c h a r a c t e r i s e d in that ozone is fed into the water flow at just one point.

4. Device according to any one of the preceding claims,
c h a r a c t e r i s e d in that the distance between the mixers (5a ... 5f) and the flow rate of the liquid are selected such that the residence time for a volume of water in one of the reaction zones (6a ... 6e) between leaving one mixer and entering the next

mixer is between 0.5 seconds and 30 seconds, preferably between 1 and 10 seconds.

5. Device according to any one of the preceding claims, **c h a r a c t e r i s e d** in that the mixers (5a ... 5f) and the reaction zones (6a ... 6e) are arranged in a pipe that is bent in a loop-like manner.

6. Device according to any one of the preceding claims, **c h a r a c t e r i s e d** in that the mixers (5a ... 5f) and the reaction zones (6a ... 6e) are arranged in a vertical orientation.

7. Device according to any one of the preceding claims, **c h a r a c t e r i s e d** in that a feeding-in of hydrogen peroxide or other reagents is provided.

8. Device according to claim 7, **c h a r a c t e r i s e d** in that the feeding-in is provided upstream of the ozone feed point (4).

9. Device according to claim 7, **c h a r a c t e r i s e d** in that the feeding-in is provided downstream of the ozone feed point (4) between two mixers (5a ... 5f).

10. Device according to any one of the preceding claims, **c h a r a c t e r i s e d** in that a region (10, 11) for irradiation with electromagnetic waves, in particular with UV radiation, is provided between at least two mixers or after the last mixer (5a ... 5f).

11. Method for treating contaminated liquids in a flow by means of ozone, **c h a r a c t e r i s e d** in that the ozone is fed in gas form into the flow at one point and then is mixed into the flow in stages by means of mixers (5a ... 5f) following one another in the flow direction, so that the absolute quantity of introduced ozone increases after each mixer until a feed efficiency of more than 95% is reached.

12. Method according to claim 11, **c h a r a c t e r i s e d** in that ozone is fed into the water flow at just one point.

13. Method according to any one of the preceding claims 11 - 12, **c h a r a c t e r i s e d** in that the distance between the mixers (5a ... 5f) and the flow rate of the liquid are selected such that the residence time for a volume of liquid in one of the reaction zones (6a ... 6e) between leaving one mixer and entering the next mixer is between 0.5 seconds and 30 seconds, preferably between 1 and 10 seconds.

14. Method according to any one of the preceding claims 11 - 13, **c h a r a c t e r i s e d** in that a feeding-in of hydrogen peroxide or other reagents into the liquid takes place.

15. Method according to claim 14, **c h a r a c t e r i s e d** in that the feeding-in takes place upstream of the ozone feed point (4).

16. Method according to claim 14, **c h a r a c t e r i s e d** in that the feeding-in takes place downstream of the ozone feed point (4).

17. Method according to claim 16, **c h a r a c t e r i s e d** in that the feeding-in takes place in one of the reaction zones (6a ... 6e).

18. Method according to any one of the preceding claims 11 - 17, **c h a r a c t e r i s e d** in that an irradiation with electromagnetic waves, in particular with UV radiation, takes place between at least two mixers or after the last mixer (5a ... 5f).

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A device for treating liquids by means of ozone, comprising a pipe in which a main flow of the liquid is guided in a flow direction from an inlet to an outlet, comprising an ozone feed point at which ozone can be introduced in gas form into the main flow, and comprising at least two mixers which are located downstream of the ozone feed point, wherein the mixers are arranged at a distance from one another, wherein at least one reaction zone is formed between the mixers, wherein the mixers are designed in such a way that they each dissolve only a portion of the ozone in the main flow that has been introduced in gas form, and wherein ozone is fed into the water flow at just one point.

2. A device according to claim 1, wherein the mixers are in each case static mixers without any movable parts.

3. A device according to either one of the preceding claims, wherein the distance between the mixers and the flow rate of the liquid are selected such that a residence time for a volume of water in one of the reaction zones between leaving one mixer and entering the next mixer is between 0.5 seconds and 30 seconds.

4. A device according to claim 3, wherein the distance between the mixers and the flow rate of the liquid are selected such that the residence time is between 1 and 10 seconds.

5. A device according to any one of the preceding claims, wherein the mixers and the reaction zones are arranged in a pipe that is bent in a loop-like manner.

6. A device according to any one of the preceding claims, wherein the mixers and the reaction zones are arranged in a vertical orientation.

7. A device according to any one of the preceding claims, wherein a feeding-in of hydrogen peroxide or other reagents is provided.

8. A device according to claim 7, wherein the feeding-in is provided upstream of the ozone feed point.

9. A device according to claim 7, wherein the feeding-in is provided downstream of the ozone feed point between two mixers.

10. A device according to any one of the preceding claims, wherein a region for irradiation with electromagnetic waves is provided between at least two mixers or after the last mixer.

11. A device according to claim 10, wherein the region is for irradiation with UV radiation.

12. A method for treating contaminated liquids in a flow by means of ozone, wherein the ozone is fed in gas form into the flow at one point and then is mixed into the flow in stages by means of mixers following one another in the flow direction, so that the absolute quantity of introduced ozone increases after each mixer until a feed efficiency of more than 95% is reached.

13. A method according to claim 12, wherein the ozone is fed into the water flow at just one point.

14. A method according to claim 12 or claim 13, wherein the distance between the mixers and the flow rate of the liquid are selected such that a residence time for a volume of liquid in at least one reaction zones between leaving one mixer and entering the next mixer is between 0.5 seconds and 30 seconds.

15. A method according to claim 14, wherein the distance between the mixers and the flow rate of the liquid are selected such that the residence time is between 1 and 10 seconds.

16. A method according to any one of claims 12 to 15, wherein a feeding-in of hydrogen peroxide or other reagents into the liquid takes place.

17. A method according to claim 16, wherein the feeding-in takes place upstream of an ozone feed point.

18. A method according to claim 16, wherein the feeding-in takes place downstream of an ozone feed point.

19. A method according to claim 18, wherein the feeding-in takes place in one of the reaction zones.

20. A method according to any one of claims 11 to 19, wherein an irradiation with electromagnetic waves takes place between at least two mixers or after the last mixer.

21. A method according to claim 20, wherein the irradiation takes place with UV radiation.