Claims

1. A device for dispersing gas in a liquid with a number n of successive zones Z_1, Z_2,..., Z_n with static mixing elements, each zone Z_i having a length L_i and an effective diameter D_i, characterized in that the individual zones are constructed such that the mechanical energy input E_i normalized to the respective ratio L_i/D_i increases from zone to zone in the direction of flow, wherein n is an integer greater than or equal to 3 and i is an index which runs through the integers from 1 to the number n of zones.

2. The device as claimed in claim 1, characterized in that the average channel diameter d_i becomes smaller in the zones Z_1 to Z_n succeeding one another in the direction of flow.

3. The device as claimed in claim 1, characterized in that the mixing elements present in the zones Z_1 to Z_n have the same ratio d_i/D_i and an effective diameter D_i which becomes increasingly smaller from zone to zone in the direction of flow.

4. The device as claimed in claim 1, characterized in that the zones Z_1 to Z_n have mixing elements of different types, which at the same ratio L_i/D_i cause an increasing pressure drop from zone to zone in the direction of flow.

5. The device as claimed in one of the preceding claims, characterized in that there is a first zone Z_0, which achieves a higher specific energy input E_0 than the next zone Z_1 in the direction of flow.

6. The device as claimed in one of claims 1 to 5, further comprising a tube or a thin capillary for feeding gas into the device, characterized in that the tube or the thin capillary is mounted upstream of the arrangement of mixing elements.

7. The device as claimed in one of claims 1 to 5, further comprising a porous or screen-like body for feeding gas into the device, characterized in that the body is mounted upstream of the arrangement of mixing elements.

8. A method for dispersing gas in a liquid, in which gas and liquid are conveyed jointly through a mixing device and, in the process, flow through a number n of successive zones Z_1, Z_2,..., Z_n with static mixing elements, each zone Z_i having a length L_i and an effective diameter D_i, characterized in that the mechanical energy input E_i acting on the gas/liquid mixture and normalized to the respective ratio L_i/D_i increases from zone to zone in the direction of flow, wherein n is an integer greater than or equal to 3 and i is an index which runs through the integers from 1 to the number n of zones.

9. The method according to claim 8, characterized in that the liquid has a viscosity of between 2 mPa·s and 10,000,000 mPa·s, particularly preferably between 1,000 mPa·s and 1,000,000 mPa·s.

Claims

1. A device for dispersing gas in a liquid with a number n of successive zones Z_1, Z_2,..., Z_n with static mixing elements, each zone Z_i having a length L_i and an effective diameter D_i, characterized in that the individual zones are constructed such that the mechanical energy input E_i normalized to the respective ratio L_i/D_i increases from zone to zone in the direction of flow, wherein n is an integer greater than or equal to 3 and i is an index which runs through the integers from 1 to the number n of zones and that the mixing elements present in the zones Z_1 to Z_n have the same ratio d_i/D_i and an effective diameter D_i which becomes increasingly smaller from zone to zone in the direction of flow.

2. The device as claimed in claim 1, characterized in that the average channel diameter d_i becomes smaller in the zones Z_1 to Z_n succeeding one another in the direction of flow.

3. The device as claimed in claim 1, characterized in that the zones Z_1 to Z_n have mixing elements of different types, which at the same ratio L_i/D_i cause an increasing pressure drop from zone to zone in the direction of flow.

4. The device as claimed in one of the preceding claims, characterized in that there is a first zone Z_0, which achieves a higher specific energy input E_0 than the next zone Z_1 in the direction of flow.

5. The device as claimed in one of claims 1 to 4, further comprising a tube or a thin capillary for feeding gas into the device, characterized in that the tube or the thin capillary is mounted upstream of the arrangement of mixing elements.

6. The device as claimed in one of claims 1 to 4, further comprising a porous or screen-like body for feeding gas into the device, characterized in that the body is mounted upstream of the arrangement of mixing elements.

7. A method for dispersing gas in a liquid, in which gas and liquid are conveyed jointly through a mixing device according to one of the claims 1 to 6, and, in the process, flow through a number n of successive zones Z_1, Z_2,..., Z_n with static mixing elements, each zone Z_i having a length L_i and an effective diameter D_i, characterized in that the mechanical energy input E_i acting on the gas/liquid mixture and normalized to the respective ratio L_i/D_i increases from zone to zone in the direction of flow, wherein n is an integer greater than or equal to 3 and i is an index which runs through the integers from 1 to the number n of zones.

8. The method according to claim 7, characterized in that the liquid has a viscosity of between 2 mPa·s and 10,000,000 mPa·s, particularly preferably between 1,000 mPa·s and 1,000,000 mPa·s.