

PATENT CLAIMS

1. Cartridge (8) for use in a showerhead or tap for dispensing a liquid, in particular
5 water or a water-based mixture, comprising a set of at least two, in particular
exactly two, nozzles (12) arranged to create colliding jets of the liquid and
thereby create a spray of droplets of the liquid, and a spray shaper 84 for guiding
the spray,
wherein an inner diameter of the nozzles (12) is between 0.8 and 1.5 millimetres,
10 and
wherein, a throat (3) of each of the nozzles (12), along which the nozzle (12) has
a constant diameter, has a second length (L2) that is at least three times this
inner diameter, and in particular at least 2.4 or at least three millimetres.
- 15 2. The cartridge (8) of claim 1, wherein a radius (Re) of an edge forming a
transition between the inner surface of the nozzles (12) and the inner surface of
the spray shaper (84) is less than two or less than one or less than 0.8 or less than
0.5 millimetres, in particular less than 0.3 millimetres.
- 20 3. The cartridge (8) of claim 1 or claim 2, wherein a distance between a collision
point, at which the jets collide, and a front surface (88) of the cartridge (8) is
three to four times, or five to nine times, in particular six to eight times, in
particular seven times a distance between nozzle outlets (6) and a point at which
the jets collide
- 25 4. The cartridge (8) of one of the preceding claims, wherein, at an edge forming a
transition between the inner surface of the nozzles (12) and the surface of the
spray shaper (84) forms an acute angle, in particular an angle of less than 85° or
less than 80° or less than 75°.

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5. The cartridge (8) of one of the preceding claims, wherein the entirety of elements acting as spray shaper are part of the cartridge (8) itself.
6. The cartridge (8) of one of the preceding claims, wherein the spray shaper (84),
5 at an outer end of the spray shaper (84) opposite to the spray shaper back end (85), ends with a flow guiding edge (86) forming an acute angle (Φ_{11}) between an inner surface of the spray shaper (84) and an adjacent, intermediate surface (89), in particular an angle of less than 85° or less than 80° or less than 75° .
- 10 7. The cartridge (8) of claim 6, wherein a radius (R_f) of the flow guiding edge (86) is less than two or less than one or less than 0.8 or less than 0.5 or less than 0.3 millimetres.
8. The cartridge (8) of one of claims 6 or 7, wherein the intermediate surface (89),
15 beginning at the flow guiding edge (86), extends in the direction of the spray shaper back end (85), and then again in the opposite direction, passing into a front surface (88) of the cartridge (8),
9. The cartridge (8) of claim 8, wherein a radial distance (d_R) between the flow
20 guiding edge (86) and a point at which the intermediate surface (89) passes into the front surface (88) is at least three millimetres, in particular at least four millimetres, in particular at least five millimetres.
10. The cartridge (8) of claims 6 to 9 wherein the front surface (88) is distanced
25 from the spray shaper back end (85) more than the flow guiding edge (86) is.
11. The cartridge (8) of one of the preceding claims, wherein the spray shaper (84), including the flow guiding edge (86), is integrally shaped as part of a skirt (83) of the cartridge (8).

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12. The cartridge (8) of one of the preceding claims, wherein at least the spray shaper (84) and the nozzles (12) comprise surfaces with a roughness (Ra) that is smaller than 0.8 micrometres, corresponding to ISO Roughness Grade N6, in particular smaller than 0.2 micrometres, corresponding to ISO Roughness Grade N4.
13. Method for operating the cartridge (8) of one of the preceding claims in a showerhead or tap for dispensing a liquid, in particular water or a water-based mixture, comprising the steps of
- providing the liquid to the cartridge (8) with a pressure in the range of 1 bar to 5 bar, in particular from 1 bar to 3 bar, and more particular, from 1.5 bar to 3 bar; guiding the liquid through a pair of nozzles 12 with a flow rate between 2 litres per minute and 3 litres per minute, in particular with 2.5 litres per minute,
14. An outlet (7), comprising
- a cartridge connection section (72b) with outlet connection elements (72) for connecting the outlet (7) to a cartridge (8) according to one of claims 1 to 12 or 16 to 24,
- an outlet supply section (71b) with an outlet supply connector (71) for connecting the outlet (7) to a liquid supply, such as a hose,
- the outlet supply section (71b) being in liquid communication with the cartridge connection section (72b) via a conduit (75) through an outlet body (73) connecting the outlet connection element (72) with the outlet supply connector (71),
- wherein the outlet supply connector (71) is designed to secure a cartridge (8) attached to the outlet (7).
15. The outlet (7) of claim 14, wherein the outlet (7) comprises a straight pipe section constituting the outlet body (73) and an angled section constituting the cartridge connection section (72b), the cartridge connection section (72b) being

arranged for the cartridge (8) to be connected to the outlet (7) at an angle between 60° and 120°, in particular between 80° and 100° and in particular at an angle of 90°.

- 5 16. The cartridge (8) of one of claims 1 to 12, wherein the cartridge (8) is free from filters.
17. The cartridge (8) of one of claims 1 to 12 or 16, wherein the cartridge (8) is free from elements that reverse a flow of liquid in the cartridge (8).
- 10 18. The cartridge (8) of one of claims 1 to 12 or 16 to 17, wherein a distance between a point at which the jets collide and a spray shaper back end (85) lies between 2 and 7, in particular between 3 and 5, in particular between 3 and 4 millimetres.
- 15 19. The cartridge (8) of one of claims 1 to 12 or 16 to 18, wherein an angle at which the nozzles exit at an inner surface of the spray shaper (84) is more than 70°, in particular more than 80° and in particular equal to 90°.
- 20 20. The cartridge (8) of one of the claims 1 to 12 or 16 to 19, wherein the inner surface of the spray shaper (84) is cylindrical.
- 25 21. The cartridge (8) of one of claims 1 to 12 or 16 to 20, wherein the cartridge (8) is fabricated in one piece or is fabricated from separate parts that are inseparably moulded or welded or glued together.
22. The cartridge (8) of one of claims 1 to 12 or 16 to 21, wherein the cartridge (8) comprises cartridge connection elements (82) for mechanically attaching the

cartridge (8) to an outlet and securing the cartridge (8), in particular wherein the cartridge connection elements (82) are a thread.

23. The cartridge (8) of one of claims 1 to 12 or 16 to 22, wherein the nozzles each
5 have an asymmetrical cross section, with a narrower part of the cross section being closer to a bisecting line of the longitudinal axes of the nozzles, and a broader part of the cross section being further away from the bisecting line.
24. The cartridge (8) of claim 23, wherein the nozzle cross section is a triangle or a
10 triangle with rounded corners.
25. A water nozzle insert 10 for use in the cartridge (8) of one of claims 1 to 12 or
16 to 24, comprising a nozzle (12),
wherein an inner diameter (D2) of the nozzle (12) is between 0.8 and 1.5
15 millimetres, and
wherein, a throat (3) of the nozzle (12), along which the nozzle (12) has a constant diameter, has a second length (L2) that is at least three times this inner diameter, and in particular at least 2.4 or at least three millimetres.
- 20 26. The outlet (7) of claim 14 or 15 wherein the outlet (7) is fabricated in one piece or is fabricated from separate parts that are inseparably moulded or welded or glued together.
27. The outlet (7) of claim 14 or 15 or 26 wherein the conduit (75), except for an
25 optional filter in the outlet supply section (71b), is free from filters, and optionally also free from elements that reverse a flow of liquid in the conduit (75).