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(54) **TOILET COMPRISING A WASHING SYSTEM**

(57) A toilet (1) comprising:
 - a body (2) having a basin (3), the basin having an upper opening (4), an inner side wall (5) and a bottom portion (6);
 - a discharge conduit (7) connected to the bottom portion (6) of the basin (3);
 - a siphon (8) operatively interposed between the basin (3) and the discharge conduit (7);
 - a feeding opening (9) adapted and configured to receive washing water in input, having an opening axis (a1) ;
 - a toilet washing system (1) communicating with the

feeding opening (9) of washing water for introducing washing water into the toilet (3);
 characterized in that the washing system comprises:
 - an antechamber (10) communicating with the feeding opening (9);
 - a first outlet conduit (11) communicating with the antechamber (10) and having a first outlet opening (110) arranged inside the antechamber (10) and a first outlet opening (111) arranged inside the siphon (8) to introduce a jet of washing water into the siphon (8).

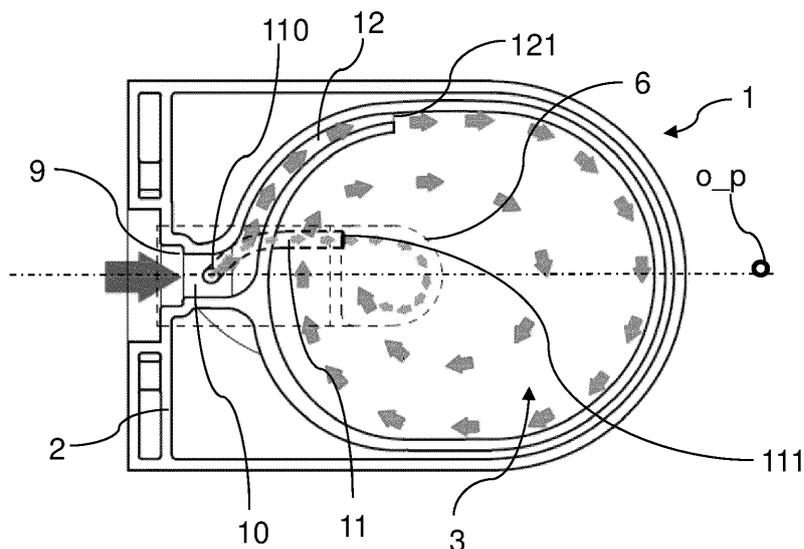


FIG. 4

Description**FIELD OF THE INVENTION**

[0001] The present invention relates to the technical field of sanitary appliances and, in particular, to a toilet comprising an improved washing system.

PRIOR ART

[0002] Toilets with a water-saving closed flushing rim washing system are known. In such toilets, the washing system is provided to deliver side sprinkler jets on the walls of the basin. These side jets are provided in particular by a toilet rim which completely surrounds the upper opening of the basin and which is internally hollow to form a channel. The flushing rim comprises a plurality of holes oriented towards the bottom of the basin. The flushing rim also performs a function of containing the washing water. The presence of the flushing rim, however, does not allow glazing inside the channel and the channel itself cannot be cleaned, which makes the toilet hygienically inappropriate. Furthermore, the toilets equipped with this type of rim have production problems, because the holes in the rim can often be completely or partially occluded by the enamel.

[0003] Toilets with concave flushing rim are known, in which the water is expelled all at once from a rear part of the basin. The water breaks and is diverted by a dedicated ceramic component and the flow is conveyed centrally and is channeled laterally by a concave rim that controls the flow.

[0004] The spread of rimless toilets is recently on the rise. In such toilets, the washing system does not deliver through side sprinkler jets because there is no rim at all on such toilets. By virtue of the absence of rims, these toilets have improved hygiene performance and are easier to clean, e.g. with a cloth or brush.

[0005] The aforesaid toilets of the prior art still have some drawbacks. A first drawback is given by the fact that a non-negligible amount of washing water may escape inadvertently from the toilet in the form of droplets or nebulized form when the flushing is operated to wash the basin. This effect is particularly annoying and has negative repercussions in terms of hygiene. A second drawback is given by the fact that a relatively large amount of water is required to wash the basin, which is clearly a problem because of the negative effects on domestic consumption and the environment. A third drawback is the noise which can be perceived during the flow of the washing water.

[0006] Rimless toilets are easier to clean than toilets with flushing rim; however, in such toilets, the washing water can hardly reach the top of the basin because the washing system is designed so that the washing water does not escape out of the basin. Standard UNI EN 997 currently allows an 85mm high band defined inside the basin from the upper edge of the rim in which the toilet

may not be washed by the water jet. So, although these types of toilet are relatively easier to clean, e.g. with a cloth or a brush, they also have hygiene performance which can be improved.

[0007] It is the object of the present invention to provide a toilet having an improved washing system which allows solving, either entirely or in part, the drawbacks described above with reference to the toilets of the known art described above.

[0008] Such an object is achieved by a toilet as defined in general in claim 1. Alternative preferred and advantageous embodiments of the aforesaid toilet are defined in the accompanying dependent claims.

[0009] The invention will be better understood from the following detailed description of particular embodiments, provided by way of example and consequently not limiting in any manner, with reference to the accompanying drawings which are briefly described in the following paragraph.

BRIEF DESCRIPTION OF THE DRAWINGS**[0010]**

Figure 1 shows a plan view from the top of a non-limiting example of an embodiment of a toilet.

Figure 2 shows a side plan view of the toilet in figure 1.

Figure 3 shows a cross-section view of the toilet in figure 1 taken along the vertical section plane p1 in figure 1.

Figure 4 shows a section plan view from the top of the toilet in figure 1 taken along the horizontal plane p3 in figure 2.

Figure 5 is a longitudinal section plan view of the toilet in figure 1 taken along vertical plane p2 in figure 2;

Figure 6 shows a longitudinal section plan view, similar to figure 5, of a possible variant embodiment of the toilet in figures 1-5.

DETAILED DESCRIPTION

[0011] Similar or equivalent elements in the appended figures are indicated by the same reference symbols.

[0012] Figures from 1 to 5 show a first non-limiting example of an embodiment of a toilet 1.

[0013] Toilet 1 comprises a body 2 having a basin 3. Basin 3 has an upper opening 4, an inner side wall 5, and a bottom portion 6. In the example, without introducing any limitation, the upper opening 4 of basin 3 has an elliptical shape. Alternatively, this shape could be oval. In a further variant, the upper opening 4 has a quadran-

gular or substantially quadrangular shape, i.e. quadrangular with rounded corners.

[0014] Toilet 1 comprises a siphon 8 and the bottom portion 6 of basin 3 flows into siphon 8 or defines itself the siphon 8 at least in part.

[0015] Preferably, without introducing any limitation, the body 2 of toilet 1 is a monoblock, preferably ceramic, structure.

[0016] In the particular non-limiting embodiment shown in the figures, toilet 1 is adapted to be installed suspended on a vertical wall at a given distance from the ground. According to an alternative embodiment, toilet 1 could be configured to be installed on a supporting surface, i.e. it is a toilet configured for non-hanging installation.

[0017] Toilet 1 comprises a discharge conduit 7 connected to the bottom portion 6 of basin 3. Siphon 8 is operationally interposed between basin 3 and the discharge conduit 7, and in particular between the bottom portion 6 of basin 3 and discharge conduit 7. The discharge conduit 7 is designed and configured to be operationally connected by piping to a sewer system. Conveniently, siphon 8 is a U-shaped conduit which connects the bottom portion 6 to the discharge conduit 7.

[0018] Toilet 1 further comprises a feeding opening 9 which is adapted and configured to receive in input washing water from the toilet. The feeding opening 9 has an opening axis a_1 . The feeding opening 9 is adapted and configured to be operationally connected to a flushing assembly, not shown in the figures, and preferably through said flushing assembly to a water supply. As known in itself, e.g. the flushing assembly preferably comprises a washing water collection tank and a water conduit which connects the feeding opening 9 to the collection tank.

[0019] Toilet 1 further comprises a washing system, preferably integrated in the body 2, communicating with the washing water feeding opening 9 for introducing washing water into the toilet.

[0020] The washing system comprises an antechamber 10 communicating with the feeding opening 9. Such antechamber 10 is preferably defined inside body 2 of the toilet.

[0021] The toilet washing system further comprises a first outlet conduit 11 communicating with the antechamber 10 and having a first outlet opening 111 arranged inside siphon 8 to introduce a jet of washing water into siphon 8. It is worth noting that, in this manner, the first outlet conduit 11 allows introducing a jet of water directly into siphon 8 and in particular into the water contained in siphon 8. It is worth noting that the first outlet conduit 11, in fact, bypasses the side wall 5 of basin 3. Experimental tests have shown that the jet of washing water coming out of outlet opening 111 of the outlet conduit 11 allows the organic waste present in basin 3 to be cleared very effectively.

[0022] The outlet conduit 11 has an inlet opening 110 located inside antechamber 10.

[0023] According to an advantageous embodiment, the first outlet conduit 11 is a tubular channel, e.g. of circular cross-section and e.g. made of ceramic material.

[0024] According to an advantageous embodiment, the outlet opening 111 is offset with respect to a vertical plane p_2 of the longitudinal central section of the body 2 of toilet 1. This is obtained, for example, by providing that the first outlet conduit 11 extends either exclusively, or predominantly, laterally with respect to said vertical plane p_2 . Preferably, the outlet opening 111 is located to the right of the aforesaid vertical plane p_2 with respect to an observation point p_o placed in front of the toilet.

[0025] According to an advantageous embodiment, the first outlet conduit 11 is immediately adjacent to the side wall 5 of basin 3 and is arranged on the opposite side of basin 3 with respect to it.

[0026] According to an advantageous embodiment, the first outlet conduit 11 is a laterally closed and curvilinear conduit. Preferably, the side wall 5 of basin 3 has a curvilinear pattern and the first outlet conduit follows the curvilinear pattern of the side wall 5 along its extension from the inlet opening 110 to the outlet opening 111.

[0027] According to a particularly advantageous embodiment, the outlet opening 111 is offset with respect to the inlet opening 110 both horizontally and vertically.

[0028] According to a particularly effective embodiment, the first outlet conduit 11 is designed, i.e. adapted and configured, to produce a jet of washing water with a clockwise direction in siphon 8.

[0029] According to an embodiment, the inlet opening 110 lies on a plane p_4 inclined with respect to the opening axis a_1 , e.g. inclined at an angle comprised between 30° and 60° , e.g. equal to 45° .

[0030] According to an embodiment, the first outlet conduit 11 is integrated into the body 2 of toilet 1, e.g. it is part of the monoblock structure of the toilet. For example, if the body 2 is obtained by molding, the first outlet conduit 11 is defined in the molding process of body 2.

[0031] According to a particularly advantageous embodiment, the washing system further comprises a second outlet conduit 12 having a second outlet opening 121, the second outlet conduit 12 being connected to antechamber 10 and being adapted to produce a jet which is tangential to the side wall 5 of basin 3, thus diverting a washing water portion laterally with respect to the opening axis a_1 . In the toilet 1, the aforesaid tangential jet creates a vortex of water to clean the inner side surface 5 of the basin 3. In particular, such vortex is preferably clockwise.

[0032] According to a particularly advantageous embodiment, the second outlet conduit 12 is a curvilinear conduit.

[0033] According to a possible embodiment, the cross-section of the second outlet conduit 12 progressively decreases towards the second outlet opening 121. This dimensional reduction has the advantage of accelerating the speed of the tangential jet of the washing water escaping from the outlet opening 121.

[0034] According to an advantageous embodiment, the second outlet conduit 12 rises in height on the inner side wall 5 of the basin 3 starting from the antechamber 10 towards the second outlet opening 121. This expedient allows reaching the highest part of the inner side wall 5 of basin 3 with the tangential jet. To rise higher, for example, the second outlet conduit 12 narrows and concentrates progressively upwards towards the second outlet opening 121.

[0035] According to a particularly advantageous embodiment, the upper opening 4 of basin 3 is surrounded at least in part by a containment rim 20 which protrudes inwards with respect to the side wall 5 of the basin 3, preferably only horizontally. Such containment rim 20 preferably protrudes only horizontally and is, therefore, a shelf. Such containment rim 20 is a full rim (i.e. without internal cavity), i.e. it can be defined as an open rim. In other words, this containment rim 20 does not perform the function of delivering washing water but only that of containing the washing water to prevent unwanted splashes from escaping from basin 3.

[0036] Preferably, the containment rim 20 surrounds the entire upper opening 4 or a prevailing part of said upper opening 4, e.g. the whole of the upper opening 4 with the exception of a part of this placed adjacent to antechamber 10.

[0037] For example, the containment rim 20 protrudes inwards from basin 3 in relation to the side wall 5 of a quantity within the range [1cm - 3cm], including the extremes, e.g. equal to 1.5 cm.

[0038] In accordance with a particularly advantageous embodiment, the second washing opening 121 is placed immediately below the aforesaid containment edge 20.

[0039] From the above, it is apparent that a toilet 1 of the type described above allows fully achieving the set objects in terms of overcoming the drawbacks of the prior art. This has been confirmed by various tests which have confirmed that toilet 1 allows each flushing to clear the siphon 8 from organic waste and to wash the basin 3 in a surprisingly effective manner. Basin 3 is both very easy and simple to clean, e.g. with a cloth or brush. Furthermore, the aforesaid toilet is not affected by the problem of projecting unwanted splashes of washing water outside the basin or, if this happens, it is to an undetectable or very limited extent.

[0040] In the embodiment in which there is also a second outlet conduit 12, it is particularly effective to provide that the first outlet conduit 11 produces a jet of washing water in siphon 8 having a clockwise direction and the second outlet conduit 12 produces a tangential jet of washing water on the inner side wall 5 of basin 3, also having a clockwise direction. In such a manner, since there is no collision of jets or masses of water moving in opposite directions, the possibility of water splashing out of the basin is considerably reduced.

[0041] According to a particularly advantageous embodiment, the jets produced at the outlet from the first outlet conduit 11 and the second outlet conduit 12 are

mutually imbalanced in terms of flow rate. Preferably, at each flushing, the amount of washing water introduced into the toilet 1 through the first outlet conduit 11 is greater than the amount of water introduced into the toilet through the second outlet conduit 12. For example, the outlet conduits 11, 12, and the respective inlet and outlet openings are sized so that the first outlet conduit 11 introduces 60% of the washing water introduced into the toilet at each flushing while the second outlet conduit introduces the remaining 40%.

[0042] In the embodiment shown in the figures from 1 to 5, the outlet opening 111 of the first outlet conduit 11 is facing towards the bottom of the siphon 8. Other arrangements are clearly possible. For example, in the variant embodiment shown in figure 6, the outlet opening 111 faces the side of basin 3. In a further variant embodiment, not shown in the figures, the outlet opening 111 may face the side of the discharge conduit 7. Furthermore, the outlet opening 111 may lie on a vertical (or substantially vertical) or horizontal (or substantially horizontal) plane in addition to lying on an inclined plane. Thus, it could be facing downwards and to the side of the basin 3, or downwards and to the side of the discharge conduit 7.

[0043] It is worth noting that although the provision of the first outlet conduit 11 with the second outlet conduit 12 is the most advantageous solution to date, other embodiments in which the inner side wall 5 of the basin 3 is washed by an alternative system to the second outlet conduit 12, e.g. such as a sprinkling system, cannot be excluded. Although this system, e.g. for the fact of having a rim, is not optimal in terms of hygiene, in this case, it would still be possible to partially avail of the advantages of the first outlet conduit, e.g. such as the particularly effective expulsion of organic waste from the siphon also with the use of a relatively small amount of washing water.

[0044] Finally, it is worth noting that, although embodiments have been described in which the inner side wall 5 of the basin 3 is symmetrical, e.g. with respect to the longitudinal plane p2, in a further construction variant not shown in the figures such inner side wall 5 could be asymmetrical.

[0045] Notwithstanding the principle of the invention, embodiments and details may be greatly varied with respect to that described and illustrated herein exclusively by way of non-limiting example without because of this departing from the scope of protection of the invention as defined in the appended claims.

Claims

1. A toilet (1) comprising:

- a body (2) having a basin (3), the basin having an upper opening (4), an inner side wall (5) and a bottom portion (6);
- a discharge conduit (7) connected to the bot-

tom portion (6) of the basin (3);
 - a siphon (8) operatively interposed between the basin (3) and the discharge conduit (7);
 - a feeding opening (9) adapted and configured to receive washing water in input, having an opening axis (a1);
 - a toilet washing system (1) communicating with the feeding opening (9) of washing water for introducing washing water into the toilet (3);

characterized in that the washing system comprises:

- an antechamber (10) communicating with the feeding opening (9);
 - a first outlet conduit (11) communicating with the antechamber (10) and having a first outlet opening (110) arranged inside the antechamber (10) and a first outlet opening (111) arranged inside the siphon (8) to introduce a jet of washing water into the siphon (8).
2. A toilet (1) according to claim 1, wherein the first outlet conduit bypasses the inner side wall (3) of the basin (5).
 3. A toilet (1) according to claim 1 or 2, wherein the outlet opening (111) is offset with respect to a vertical plane (p2) of the longitudinal central section of the body (2) of the toilet (1).
 4. A toilet (1) according to claim 3, wherein the first outlet conduit (11) extends either exclusively, or predominantly, laterally with respect to such vertical plane (p2).
 5. A toilet (1) according to any one of the preceding claims, wherein the first outlet conduit (11) is a laterally closed and curvilinear conduit.
 6. A toilet (1) according to claim 5, wherein the side wall (5) of the basin (3) has a curvilinear pattern and the first outlet conduit follows the curvilinear pattern of the side wall (5) along its extension from the inlet opening (110) to the outlet opening (111).
 7. A toilet (1) according to any one of the preceding claims, wherein the outlet opening (111) is offset with respect to the inlet opening (110) both horizontally and vertically.
 8. A toilet (1) according to any one of the preceding claims, comprising a second outlet conduit (12) having a second outlet opening (121), the second outlet conduit being connected to the antechamber (10) and being adapted to produce a jet which is tangential to the side wall (5) of the basin (3), thus diverting a portion of washing water laterally with respect to

the opening axis (a1).

9. A toilet (1) according to claim 8, wherein the second outlet conduit (12) is a curvilinear conduit.
10. A toilet (1) according to claim 8 or 9, wherein the cross-section of the second outlet conduit (12) progressively decreases towards the second outlet opening (121).
11. A toilet according to any one of claims from 8 to 10, wherein the second outlet conduit (12) rises in height on the inner side wall (5) of the basin (3) starting from the antechamber (10) towards the second outlet opening (121), e.g. the second outlet conduit (12) narrows and progressively concentrates upwards going towards the second outlet opening.
12. A toilet (1) according to any one of the preceding claims, wherein the upper opening (4) of the basin (3) is surrounded at least in part by a full retaining rim (20) which protrudes inwards with respect to the side wall (5) of the basin (3), preferably only horizontally.
13. A toilet (1) according to any one of the preceding claims, the first outlet conduit (11) is adapted and configured to produce a jet of washing water with a clockwise direction in the siphon (8).
14. A toilet (1) according to any one of the preceding claims, wherein the inlet opening (110) lies on a plane (p4) which is inclined with respect to the opening axis (a1).
15. A toilet according to any one of claims from 8 to 10, wherein the jets produced at the outlet from the first outlet conduit (11) and the second outlet conduit (12) are imbalanced in terms of flow rate.

FIG. 1

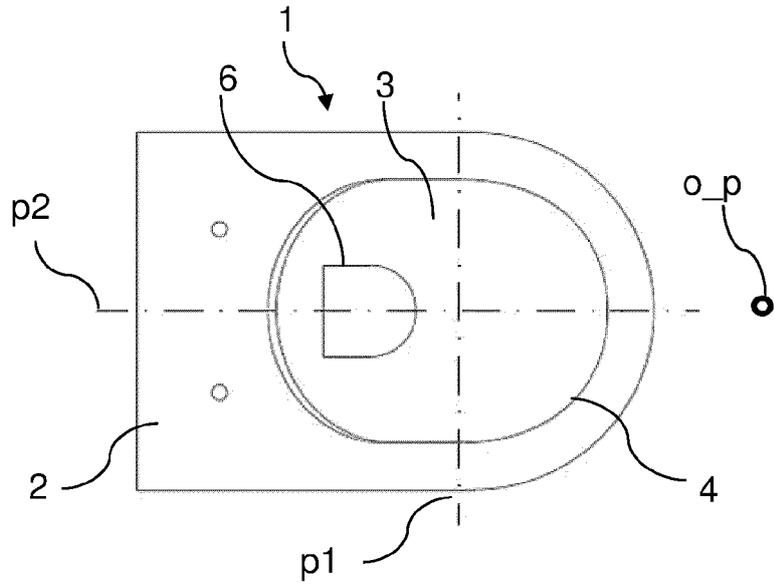


FIG. 2

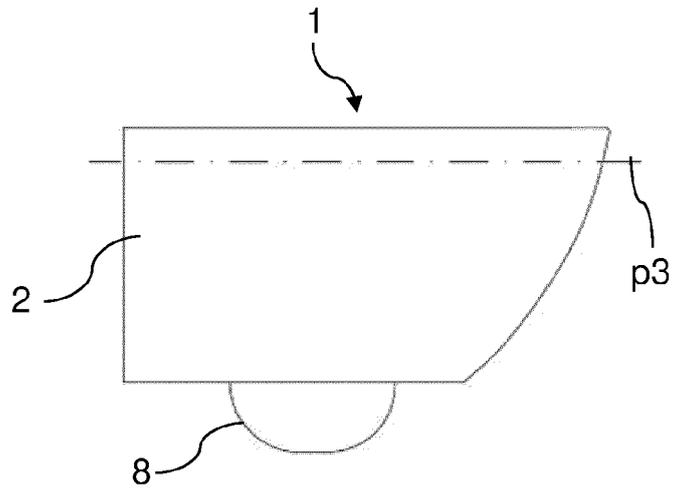
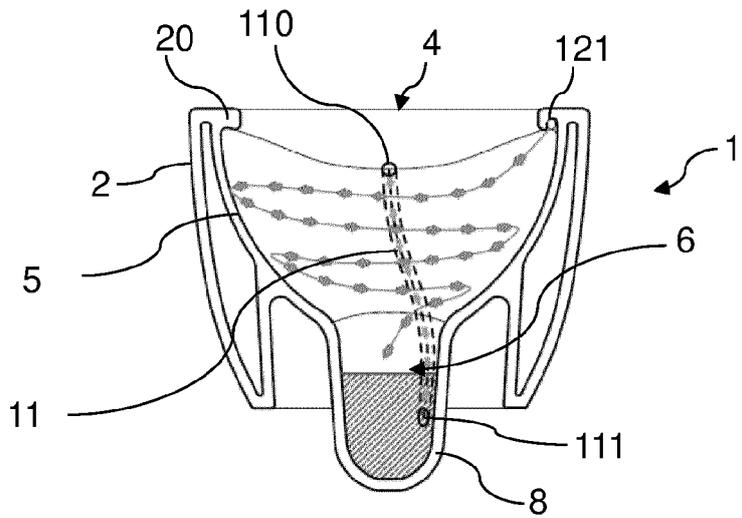


FIG. 3



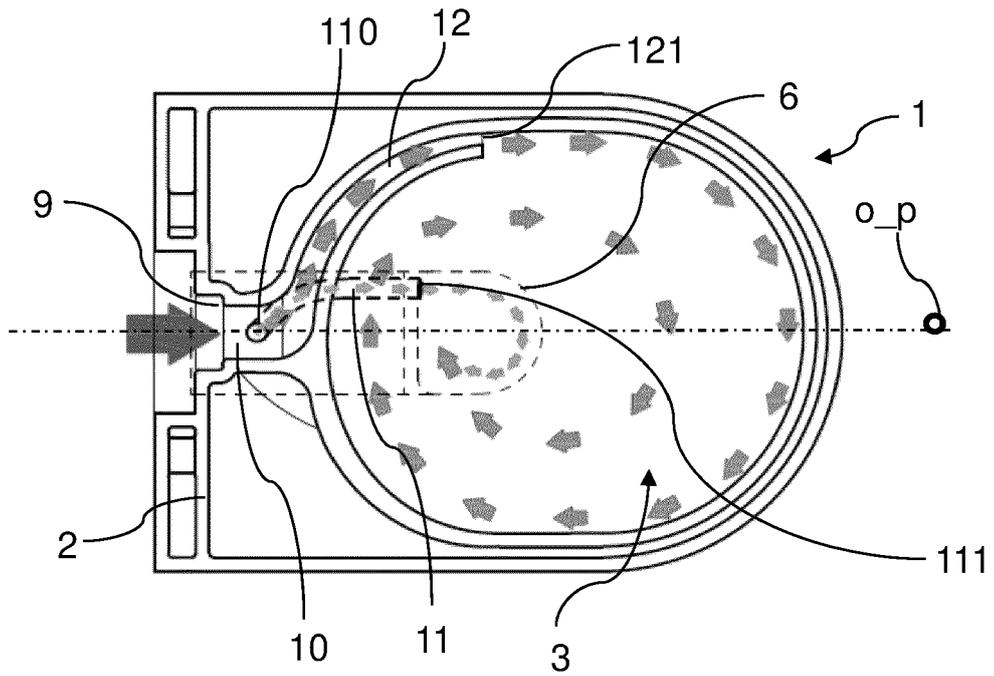


FIG. 4

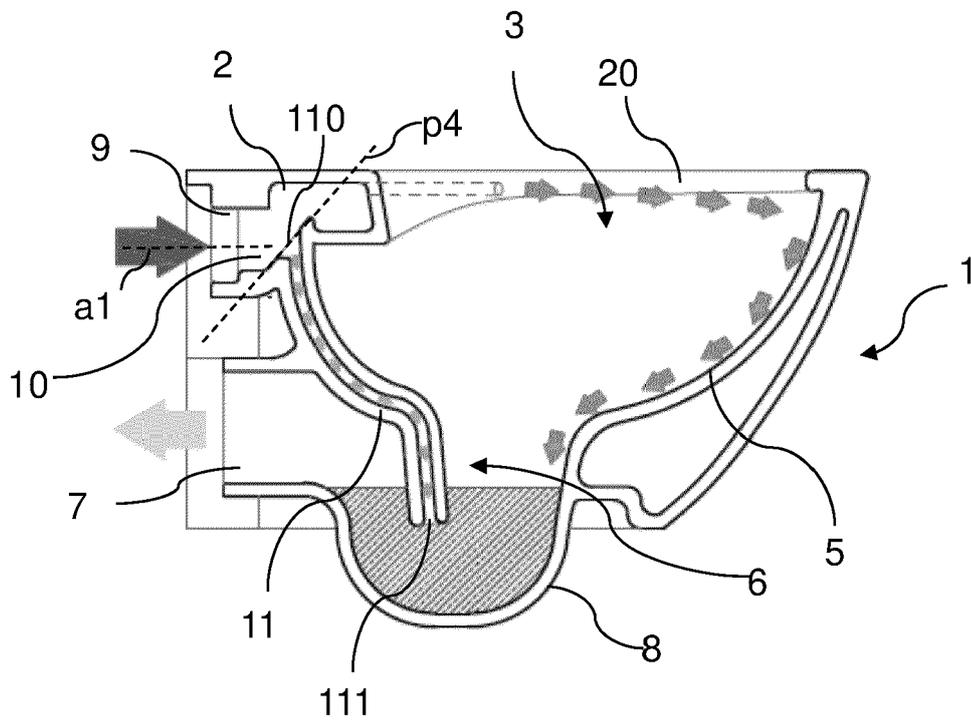


FIG. 5

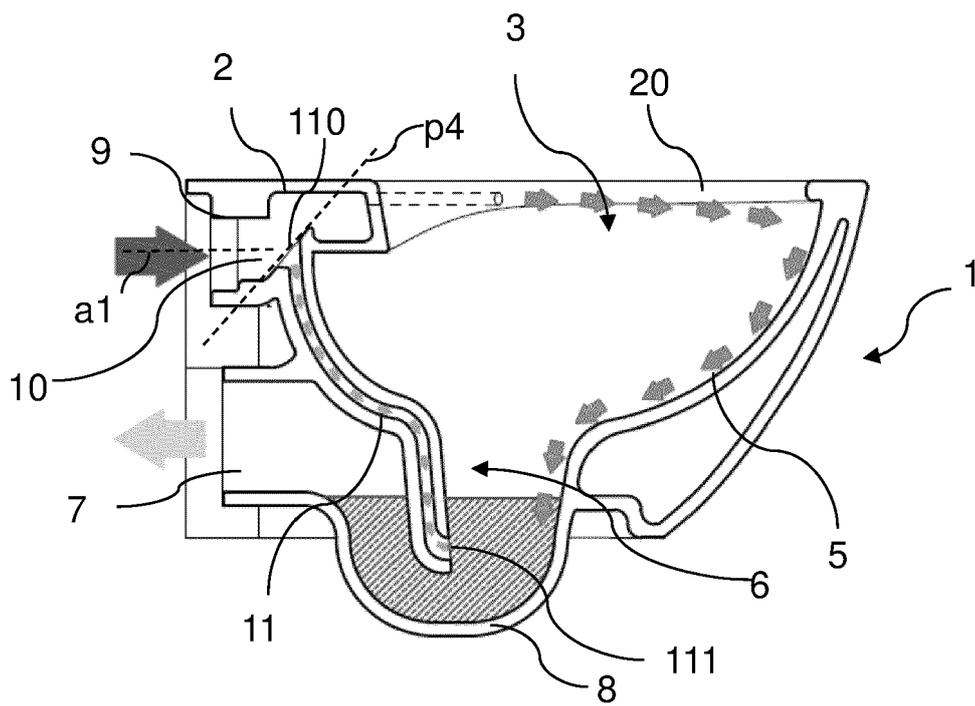


FIG. 6