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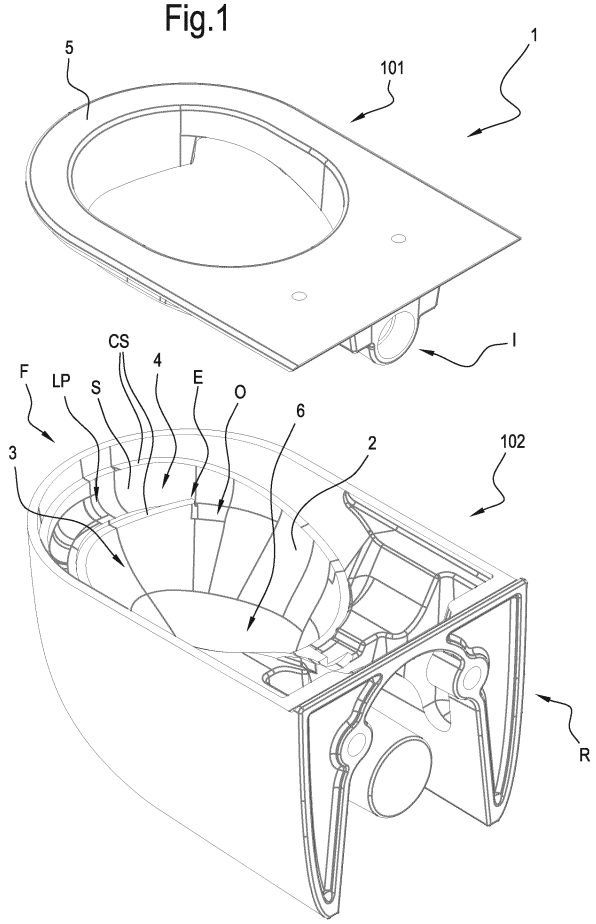
(54) **RIMLESS TOILET BOWL**

(57) A rimless toilet bowl (1) comprises: a top structure (101); a bottom structure (102), the top structure and the bottom structure being stably coupled together in order to form the rimless toilet bowl (1); a flushing water duct (4), having an internal surface (S) wherein the top structure (101) and the bottom structure (102) define the flushing water duct (4), wherein a top portion (TP) of the internal surface (S) belongs to the top structure (101) and a lower portion (LP) of the internal surface belongs to the bottom structure (102), so that the flushing water duct (4) is at least partially shared between the top structure and the bottom structure.

Fig.1

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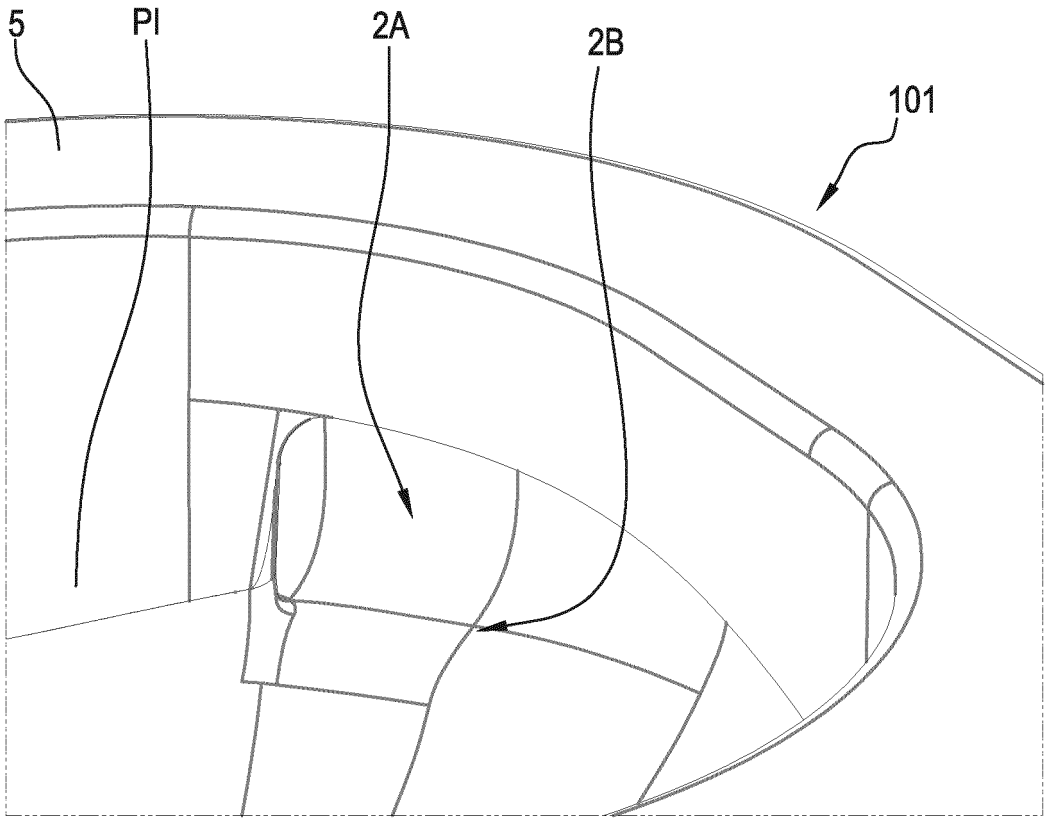



Fig. 6B

## Description

**[0001]** This invention relates to a rimless toilet bowl, a toilet, a method for flushing water in a rimless toilet bowl and a method for manufacturing a rimless toilet bowl.

**[0002]** A toilet bowl typically includes a peripheral surface on the upper face of the bowl. Usually, the peripheral surface includes a horizontal part, or edge, and a vertical part, or rim, which extends from the horizontal part downwards towards the inside of the bowl to create a channel that runs all the way round the bowl. The rim is a sort of hidden frame which is oriented downwards and which, every time we flush the toilet, channels the water in such a way that it can flow all over the entire inside surface of the bowl. In other words, the rim is a frame located at the top of the inside of the bowl and under which the water used to flush the toilet is made to flow.

**[0003]** The edge, that is the horizontal part of the peripheral surface, allows the water to be pushed out with sufficient pressure to flush the toilet but without splashing out of the bowl. The space between the horizontal edge and the rim, however, creates a constant risk of harbouring germs and bacteria.

**[0004]** In this context, patent document EP0686731A1 describes a toilet bowl with a rim.

**[0005]** Generally speaking, toilet flushing systems can be divided broadly into two categories: standard systems (that is, systems where water flows down from above) and siphonic systems (that is, systems where the water flow creates a vacuum).

**[0006]** In standard systems, also known as washdown systems, the level of the water in the bowl remains relatively constant at all times. When the flush is started, the water flows out of a water tank and into the toilet bowl. This causes a rapid rise in the water level and the excess water flows out, carrying liquid and solid waste out with it. When the flush stops, the water in the bowl returns naturally to its equilibrium level. In a siphonic system, on the other hand, flushing creates a vacuum.

**[0007]** In washdown systems, the water flows into the bowl and flows out downwards through flush passages in the bowl; the water is then drained out thanks to the vertical pressure applied on the dirty water, pushing the water from the flush passages vertically downwards so as to evacuate the contents of the bowl while it is being drained out.

**[0008]** In toilet bowls with washdown system and rim, the water from the tank flows in the channel created by the rim.

**[0009]** This solution has disadvantages, however, and can be improved.

**[0010]** For example, the part under the rim can be very difficult to clean, creating serious issues in terms of hygiene.

**[0011]** These systems are also very noisy. Moreover, improved hygiene in these systems can be achieved by ensuring that the clean water can flow over the entire inside surface of the bowl with sufficient energy to effectively clean it.

**[0012]** To overcome this problem, new-generation toilet bowls are normally made without the rim so that the entire surface is easily accessible for more effective cleaning. Furthermore, new-generation toilet bowls may or may not have the horizontal edge.

**[0013]** A rimless toilet bowl also allows using less water and considerably reduces the noise of flushing because the water does not flow through the channel created by the rim around the bowl. In new generation toilet bowls, the water comes out only from the back of the bowl and, thanks to the design of the bowl interior, is made to flow over all of the inside walls of the bowl.

**[0014]** The walls of a rimless toilet bowl have no hidden surfaces and the clean water is pushed into the bowl through one or more openings in such a way as to swirl it over the inside surface of the bowl.

**[0015]** In the new-generation solution, the bowls are rimless, with or without the horizontal edge, and have a washdown flushing system in which the clean water from the water tank does not flow vertically into the bowl through the channel created by the rim, but enters the bowl through one or more openings and is swirled around the inside surface of the bowl thanks to the vortical motion imparted to it. Patent documents EP2993274A1, US10287766B2 and US2021301513A1, US2017183855A1, US9719239B2 and US2013219605A1 describe rimless toilet bowls with a swirl flush system.

**[0016]** In this field, however, there is an ever growing need for a toilet bowl which is improved in appearance and which allows the dirty water and waste to be evacuated more efficiently and hygienically.

**[0017]** The aim of this invention is to provide a rimless toilet bowl that overcomes the above mentioned disadvantages of the prior art.

**[0018]** This aim is fully achieved by the rimless toilet bowl, toilet, method for flushing water in a rimless toilet bowl and method for manufacturing a rimless toilet bowl according to this disclosure, as characterized in the appended claims.

**[0019]** According to an aspect of it, this disclosure provides a rimless toilet bowl. The rimless toilet bowl (or bowl, for short) comprises a top structure. The top structure forms an upper peripheral face of the rimless toilet bowl. The bowl comprises a bottom structure. The top structure and the bottom structure are stably coupled together in order to form the rimless toilet bowl. The top structure and the bottom structure also provide a waste receiving surface. The waste receiving surface defines an internal volume. The bowl also comprises a flushing water duct. The flushing water duct has an inlet. The inlet of the flushing water duct is connectable to a flushing water tube. The inlet of the flushing water duct is connectable to a flushing water tube to receive the flushing water from a water tank.

**[0020]** The flushing water duct includes an outlet. The outlet is open to the internal volume. The outlet is open

to the internal volume for feeding the flushing water to the internal volume. The flushing water duct has an internal surface.

**[0021]** In an example, the top structure and the bottom structure define the flushing water duct. In particular, a top portion of the internal surface belongs to the top structure and a lower portion of the internal surface belongs to the bottom structure, so that the internal surface of the flushing water duct is at least partially shared between the top structure and the bottom structure.

**[0022]** The flushing water duct has an end portion. The end portion comprises the outlet of the flushing water duct. In an example, the orientation of the end portion relative to the waste receiving surface is such that the flushing water, upon exiting from the outlet, forms a swirl within the internal volume. This configuration allows creating a swirling motion inside the internal volume, which pushes the dirty water and the waste downwards and out of the bowl.

**[0023]** This solution ensures a more efficient, low-noise flush system which allows improving bowl hygiene.

**[0024]** The rimless toilet bowl comprises a rear side and a front side.

**[0025]** In an example, the waste receiving surface includes a first portion and a second portion. The first portion has a concavity towards the inside of the vase. The second portion is convex with respect to the first portion. The first portion is located in proximity to the end portion of the water conduit. The second portion is placed below the first portion. In particular, the second portion provides a convex part within the internal volume. The flushing water at the outlet of the flushing water duct comes into contact with the first portion and goes around the internal volume due to the convexity of the second portion. Therefore, thanks to the convexity of the second portion, the flushing water, leaving the outlet, forms a vortex inside the internal volume. The first portion is an extension of the inner surface of the flushing water duct. The first portion has the same concavity as the internal surface of the flushing water duct.

**[0026]** In an example, the inlet of the flushing water duct is located at the rear side. Further, the outlet of the flushing water duct is located at the front side of the bowl. The front side is opposite to the rear side with respect to the internal volume.

**[0027]** This configuration allows obtaining a flushing water outflow point that is hidden from the user's view during use in the waste receiving surface, thus improving both the hygiene and the aesthetic appearance of the bowl.

**[0028]** In one example, the inlet and outlet are located at first and second ends of the flushing water duct. Furthermore, the internal surface of the flushing water duct is separated from the waste receiving surface, so that the water introduced into the flushing water duct via the inlet flows into the internal surface of the duct and comes into contact with the waste receiving surface via the outlet.

**[0029]** Therefore, according to one aspect of the present disclosure it is provided that the flushing water conduit is delimited by the waste receiving surface (and by the internal volume of the bowl) and the flushing water enters the duct from the inlet, which is placed on the rear side of the bowl, and flows into the internal surface of the flushing water duct and exits the duct via the outlet, which is at the front side of the bowl, and enters the internal volume of the bowl. Furthermore, thanks to the orientation of the end portion of the flushing water duct, the flushing water forms a vortex inside the internal volume when it leaves the outlet.

**[0030]** In an example, the bowl comprises a protrusion. The protrusion extends downwardly from the top structure. The protrusion extends downwardly from the top structure for delimiting laterally the top portion of the internal surface of the flushing water duct.

**[0031]** In an example, the bottom structure has a coupling surface. The coupling surface is configured for matching a tip surface of the protrusion. In particular, the coupling surface is configured for matching a tip surface of the protrusion so that the protrusion is interposed between the internal volume and the flushing water duct.

**[0032]** This configuration allows obtaining a flushing water duct that is shared between the bottom structure and the top structure.

**[0033]** In an example, the protrusion has a helical profile around the internal volume. Further, the protrusion has an inner coil and an outer coil. In particular, the inner coil and the outer coil delimit a portion of the flushing water duct.

**[0034]** In an example, the protrusion extends vertically.

**[0035]** In an example, the outlet of the flushing water duct is shared at least partially between the top structure and the bottom structure.

**[0036]** The bottom structure may have a through passage. The through passage is configured to remove the waste. In an example, the waste receiving surface extends downwardly from the upper peripheral face to the through passage uniformly, without forming undercuts.

**[0037]** This solution allows providing a toilet bowl without hidden spaces and thus improves the hygiene of the toilet bowl.

**[0038]** Also, in an example, the inlet of the flushing water duct belongs to the top structure.

**[0039]** In one example, the inlet of the flushing water duct includes a first section and a second section. The first section of the entrance is open. The first section of the inlet is connected to the internal surface of the flushing water duct. In one example, the second section is closed so that water flows within the internal surface of the flushing water conduit in one direction only.

**[0040]** According to an aspect of it, this disclosure provides a toilet. The toilet has a toilet bowl. The toilet also has a flushing water tank. The toilet has a flushing water tube. The flushing water tube is configured to connect the flushing water tank to the toilet bowl. The toilet may also have a cover. The cover is hinged to the toilet bowl

to cover an upper peripheral face of the toilet bowl. The toilet bowl is made according to one or more aspects of this disclosure.

**[0041]** In an example, the toilet is a toilet with a wash-down flushing system.

**[0042]** According to an aspect of it, this disclosure provides a method for flushing water in a rimless toilet bowl. The method comprises a step of providing the rimless toilet bowl with a bottom structure and a top structure. The top structure and the bottom structure are stably coupled together to form the rimless toilet bowl. The top structure and the bottom structure also provide a waste receiving surface. The waste receiving surface defines an internal volume.

**[0043]** The method comprises a step of connecting an inlet of a flushing water duct to a flushing water tube. The inlet of the flushing water duct is connected to the flushing water tube to receive the flushing water from a flushing water tank.

**[0044]** The method comprises a step of discharging the flushing water into the internal volume through an outlet of the flushing water duct. The outlet is located on the waste receiving surface. The outlet is located on the waste receiving surface so that the flushing water flows from the inlet within an internal surface of the flushing water duct towards the internal volume.

**[0045]** In an example, a top portion of the internal surface belongs to the top structure. In particular, a lower portion of the internal surface belongs to the bottom structure so that the flushing water duct is at least partially shared between the top structure and the bottom structure.

**[0046]** The method may comprise a step of locating the inlet of the flushing water duct at a rear side of the rimless toilet bowl. The method may comprise a step of providing the flushing water duct with an end portion of the flushing water duct. The end portion comprises the outlet of the flushing water duct. In an example, the method comprises a step of locating the end portion of the flushing water duct so its orientation with respect to the waste receiving surface is such as to allow discharging the flushing water into the internal surface in such a way that the flushing water, upon exiting from the outlet, swirls within the internal volume.

**[0047]** The method comprises a step of discharging the flushing water into the internal volume at a front side of the rimless toilet bowl. The front side is opposite to the rear side with respect to the internal volume.

**[0048]** According to an aspect of it, this disclosure provides a method for manufacturing a rimless toilet bowl. The method comprises a step of forming a top structure in a first mould. The method comprises a step of forming a bottom structure in a second mould. The method comprises a step of assembling the top structure and the bottom structure in order to form the rimless toilet bowl. The rimless toilet bowl provides a waste receiving surface. The waste receiving surface defines an internal volume. The rimless bowl also comprises a flushing water duct. The flushing water duct has an inlet. The inlet of the flushing water duct is connected to a flushing water tube. The inlet of the flushing water duct is connected to the flushing water tube to receive the flushing water from a water tank. The flushing water duct also has an outlet. The outlet of the flushing water duct is open to the internal volume. The outlet of the flushing water duct is open to the internal volume for feeding the flushing water to the internal volume. The flushing water duct also has an internal surface.

**[0049]** A top portion of the internal surface belongs to the top structure. Further, a lower portion of the internal surface belongs to the bottom structure. The top structure and the bottom structure, when assembled, define the flushing water duct. In particular, the top structure and the bottom structure, when assembled, define the flushing water duct, so that the flushing water duct is shared between the top structure and the bottom structure.

**[0050]** The method may comprise a step of locating the inlet of the flushing water duct at a rear side of the rimless toilet bowl.

**[0051]** The method comprises a step of providing the flushing water duct with an end portion. The end portion comprises the outlet. In an example, the method comprises a step of locating the end portion so that its orientation with respect to the waste receiving surface is such as to allow discharging the flushing water into the internal surface in such a way that the flushing water, upon exiting from the outlet, swirls within the internal volume.

**[0052]** The method may comprise a step of providing the rimless toilet bowl with a protrusion. The protrusion extends downwardly from the top structure. The protrusion extends downwardly from the top structure for delimiting laterally the top portion of the internal surface of the flushing water duct. The method may comprise a step of providing the bottom structure with a coupling surface. The coupling surface is configured for matching a tip surface of the protrusion. The method comprises a step of coupling the protrusion and the coupling surface in such a way that the protrusion is interposed between the internal volume and the flushing water duct.

**[0053]** In an example, the method also comprises a step of forming the protrusion so it has a helical profile around the internal volume. The method also comprises a step of providing the protrusion with an inner coil and an outer coil. In an example, the inner coil and the outer coil delimit a portion of the flushing water duct.

**[0054]** In an example, the outlet of the flushing water duct is shared at least partially between the top structure and the bottom structure.

**[0055]** These and other features will become more apparent from the following description of a preferred embodiment, illustrated by way of non-limiting example in the accompanying drawings, in which:

- Figures 1 and 2 illustrate bottom structure and top structure of a rimless toilet bowl according to this disclosure,

- Figure 3 illustrates the rimless toilet bowl in a perspective view from above,
- Figure 4 illustrates the top structure,
- Figure 5 illustrates a toilet according to this disclosure,
- Figures 6A and 6B illustrate first and second portions of the waste receiving surface.

**[0056]** With reference to the accompanying drawings, the numeral 1 denotes a rimless toilet bowl. The rimless toilet bowl (or bowl, for short) includes a top structure 101. The top structure forms an upper peripheral face 5 of the bowl 1. The bowl also has a bottom structure 102. The top structure and the bottom structure are stably coupled together. The top structure and the bottom structure are permanently coupled together. In particular, the top structure and the bottom structure are coupled together to form the rimless toilet bowl 1. In an example, the top structure 101 is formed in a first mould. The bottom structure 102 is formed in a second mould, different from the first mould. The top structure 101 and the bottom structure 102 are assembled after moulding. In an example, the top structure and the bottom structure are formed by slip casting in the first mould and the second mould, respectively. The first and the second moulds may be hygroscopic or permeable moulds. The moulds may be composed of two or more parts. The first mould may be a two-part mould. The second mould may be a five-part mould. In an example, the bottom structure and the top structure are made by high-pressure casting.

**[0057]** The moulds may be microporous resin moulds which allow dehydrating the slip during high-pressure casting so that the slip can be gelled and lose moisture until the desired thickness is reached.

**[0058]** In particular, in one example, the forming of the top and bottom structure by slip casting inside the first mold and the second mold is carried out completely automatically, without the manual intervention of an operator. Further, during high-pressure casting, an external force is applied to close the moulds by counteracting the internal force applied by the slip which tends to open them.

**[0059]** Just after casting the bottom structure and the top structure, the two structures are joined together by means of an adhesive material for slip.

**[0060]** The bowl 1 includes a waste receiving surface 2. The waste receiving surface 2 extends downwardly to create a space for receiving the waste. The upper peripheral face 5 is located above the waste receiving surface 2. The upper peripheral face 5 extends around the waste receiving surface 2. Further, the waste receiving surface 2 defines an internal volume 3. The bowl 1 also comprises a flushing water duct 4. The flushing water duct 4 has an inlet I. The inlet I is connectable to a flushing water tube T. The inlet I is connectable to receive the flushing water (clean water) from a water tank W. In an example, the inlet I is located at a rear side R of the bowl 1. In particular, supposing the water tank W is fixed to a wall, by rear side is meant the side of the bowl 1 proximal to the wall to which the water tank W is fixed. Also, in an example, the inlet I of the flushing water duct 4 belongs to the top structure 101. The flushing water duct 4 also includes an outlet O.

**[0061]** The inlet can be extended horizontally.

**[0062]** The outlet O is open to the internal volume 3 for feeding the flushing water from the water tank W to the internal volume 3.

**[0063]** The flushing water duct 4 also comprises an internal surface S. The inlet I and the outlet O are located at two ends of the internal surface S of the flushing water duct 4.

**[0064]** In one example, the internal surface S of the flushing water duct 4 is separated from the waste receiving surface 2, so that the water introduced into the flushing water duct via the inlet I flows into the internal surface of the duct and comes into contact with waste receiving surface 2 via outlet O.

**[0065]** Thus, the water enters the duct from a first end of the duct, flows inside the internal surface S of the duct and when it arrives at a second end of the conduit (different from the first end) it leaves the duct and comes into contact with the waste receiving surface 2. Therefore, the internal surface of the duct is separated from the internal volume and the water flowing inside the internal surface S does not enter the internal volume (and does not come into contact with the waste receiving surface). The flushing water comes into contact with the waste receiving surface only when it arrives at the outlet O of the duct.

**[0066]** The outlet O of the flushing water duct is located on the waste receiving surface 2. Thus, the flushing water enters the flushing water duct 4 through the inlet I and flows in the internal surface S of the flushing water duct 4 towards the internal volume 3.

**[0067]** In one example the inlet I of the flushing water duct 4 includes a first section and a second section. The first section is open and connected to the internal surface S and the second section is closed. Therefore, when the water enters the inlet I it only leaves the first section and enters the internal surface S. In particular, the flushing water duct 4 includes a single channel inside the internal surface S, in which the water flows, so that the water flows inside the inner surface S of the flushing water duct 4 in only one direction. Therefore, the flushing water enters the flushing water duct 4 from the inlet I and flows inside the internal surface S in one direction only and exits the outlet O of the flushing water duct 4.

**[0068]** The movement of the flushing water from the inlet I to the outlet O of the flushing water duct 4 is indicated by the arrows in Figure 3. The flushing water duct 4 has an end portion E. The end portion E comprises the outlet O of the flushing water duct 4. In an example, the orientation of the end portion E relative to the waste receiving surface 2 is such that the flushing water, upon exiting from the outlet O forms a swirl within the internal volume 3. Thus, the flushing water flows in the internal

surface S around the waste receiving surface 2, enters the internal volume 3 through the outlet O of the flushing water duct 4 with rotational motion. Therefore, when the flushing water enters the internal volume 3, it moves round the waste receiving surface 2 and creates a swirl inside the internal volume 3. Also, in a preferred example, the outlet O is located at a front side F of the bowl 1. By front side is meant the side opposite to the rear side R with respect to the internal volume 3.

**[0069]** In one example, the waste receiving surface 2 includes a first portion 2A and a second portion 2B. The first portion has a concavity towards the inside of the bowl 1. The second portion is convex with respect to the first portion 2A. The first portion is placed in proximity to the end portion E of the flushing water duct 4. The second portion is placed below the first portion. In particular, the second portion provides a convex part within the internal volume 3. The flushing water at the outlet of the flushing water duct comes in contact with the first portion and goes around the internal volume due to the second portion. In particular, the second portion extends from the first portion. Therefore, the flushing water, when it comes out of the outlet O, flows along the first portion (the concave portion) and due to the convexity of the second portion it does not go down, immediately after it comes out of the outlet O of the flushing water conduit, towards the through passage, and continues to rotate around the waste receiving surface 2 inside the internal volume 3 and forms a vortex inside the internal volume. The first portion is an extension of the internal surface of the flushing water duct 4 and has the same concavity as the internal surface of the flushing water duct.

**[0070]** The internal surface S has a top portion TP and a lower portion LP. In an example, the top structure 101 and the bottom structure 102 define the flushing water duct 4. In particular, the top portion TP of the internal surface S belongs to the top structure 101. Further, the lower portion LP of the internal surface belongs to the bottom structure 102. The flushing water duct 4 is therefore at least partially shared between the top structure 101 and the bottom structure 102. In other words, the top structure 101 and the bottom structure 102, when assembled, define the flushing water duct 4, so that the flushing water duct is shared between the top structure and the bottom structure. Further, in an example, the outlet O is shared at least partially between the top structure 101 and the bottom structure 102. It should be noted that moulding the structures according to the process described above allows obtaining a flushing water duct with the above mentioned features.

**[0071]** In an example, the bowl 1 comprises a protrusion P. The protrusion P extends downwardly from the top structure 101. In particular, the protrusion P laterally delimits the top portion TP of the internal surface S of the flushing water duct 4. In an example, the protrusion P extends vertically. The protrusion P may have a helical profile around the internal volume 3. In an example, the protrusion P includes an inner coil PI and an outer coil PO. The inner coil and the outer coil delimit a portion of the flushing water duct 4. The bottom structure 102 has a coupling surface CS configured for matching a tip surface TS of the protrusion P, so that the protrusion P is interposed between the internal volume 3 and the flushing water duct 4. Thus, the top portion of the internal surface is delimited by the protrusion P and the lower portion of the internal surface is delimited by the coupling surface. In other words, when the top structure 101 and the bottom structure 102 are assembled, the tip surface TS of the protrusion P joins the coupling surface CS of the bottom structure 102 to delimit the internal surface S of the flushing water duct 4. The coupling surface CS of the bottom structure 102 has a profile similar to that of the protrusion P so that when the top structure and the bottom structure are assembled, the coupling surface receives the top surface TS of the protrusion P and the top portion TP of the internal surface S and the lower portion LP of the internal surface join to form the internal surface of the flushing water duct 4. The flushing water duct is separated from the internal volume 3 by the protrusion.

**[0072]** In particular, the internal surface S of the duct is delimited (separated) from the waste receiving surface 2 (and from the internal volume 3) by the protrusion.

**[0073]** In particular, the flushing water duct is separated from the internal volume 3 by the inner coil PI. In an example, the internal surface S of the flushing water duct is surrounded by the inner coil PI and the outer coil PO. The bottom structure 102 has a through passage 6 for removing the waste. The through passage 6 is located in a lower portion of the waste receiving surface. In an example, the waste receiving surface 2 extends downwardly from the upper peripheral face 5 to the through passage 6 uniformly, without forming undercuts. In an example, therefore, there are no undercuts or hidden surfaces between the upper peripheral face 5 and the point where the waste receiving surface 2 extends from the upper peripheral face.

**[0074]** According to an aspect of it, this disclosure provides a toilet 100. The toilet comprises a toilet bowl 1. The toilet also includes a flushing water tank W. The flushing water tank may be wall mounted. Alternatively, the flushing water tank W may be integrated in the toilet bowl 1. The toilet also includes a flushing water tube T. The flushing water tube is configured to connect the flushing water tank W to the toilet bowl 1. The toilet bowl has an inlet I. The flushing water tube T is attached to the inlet I of the toilet bowl 1. Thus, the flushing water reaches the toilet bowl 1 from the flushing water tank W through the inlet I. The toilet may also have a cover C. The cover C is hinged to the toilet bowl 1. The cover C covers an upper peripheral face 5 of the toilet bowl 1. The cover can rotate about the point where the cover C is hinged to the toilet bowl 1. The cover may also have a shape similar to that of the upper peripheral face 5 in order to cover the upper peripheral face 5. The frame may be attached to the toilet bowl at the same point where the cover C is hinged to the toilet bowl 1. When it covers the

upper peripheral face 5, the cover is placed on top of the frame. The toilet bowl 1 is made according to one or more aspects of this disclosure.

**[0075]** In an example, the toilet is a washdown toilet. By washdown is meant that when the toilet is flushed, the water pours out of a water tank into the bowl to wash away the waste from the bowl.

## Claims

**1.** A rimless toilet bowl (1), comprising:

- a top structure (101), forming an upper peripheral face (5) of the rimless toilet bowl (1);
- a bottom structure (102), the top structure and the bottom structure being stably coupled together in order to form the rimless toilet bowl (1), providing a waste receiving surface (2) defining an internal volume (3);
- a flushing water duct (4), having
an inlet (I), connectable to a flushing water tube (T) for receiving flushing water from a flushing water tank (W),
an outlet (O), open to the internal volume for feeding the flushing water to the internal volume, and
an internal surface (S),

wherein the top structure (101) and the bottom structure (102) define the flushing water duct (4), wherein a top portion (TP) of the internal surface (S) of the flushing water tank belongs to the top structure (101) and a lower portion (LP) of the internal surface of the flushing water duct belongs to the bottom structure (102), so that the internal surface (S) of the flushing water duct (4) is at least partially shared between the top structure and the bottom structure.

**2.** The rimless toilet bowl (1) according to claim 1, wherein the flushing water duct (4) has an end portion (E) including the outlet (O), the end portion being oriented with respect to the waste receiving surface (2) so that the flushing water, upon exiting from the outlet (O) forms a swirl within the internal volume (3).

**3.** The rimless toilet bowl (1) according to claim 2, wherein the waste receiving surface (2) includes a first portion (2A) and a second portion (2B), wherein the first portion is concave and the second portion is convex, the second portion being below the first portion, wherein the first portion is placed in proximity to the end portion (E), so that the water at the outlet (O) of the flushing water duct contacts the first portion and goes around the waste receiving surface (2).

**4.** The rimless toilet bowl (1) according to any of claims 1 to 3, comprising a rear side (R) and a front side (F), wherein the inlet (I) is located at the rear side and the outlet (O) is located at the front side, wherein the front side (F) is opposite to the rear side (R) with respect to the internal volume (3).

**5.** The rimless toilet bowl (1) according to any one of the preceding claims, wherein the inlet (I) and the outlet (O) are placed at a first and a second end of the flushing water duct, respectively, and wherein the internal surface (S) of the flushing water duct (4) is separated from the waste receiving surface, so that the water introduced into the flushing water duct through the inlet (I), flows into the internal surface of the duct and comes into contact with the waste receiving surface (2) through the outlet (O).

**6.** The rimless toilet bowl (1) according to any of the previous claims, further comprising a protrusion (P) extending downwardly from the top structure (101) for delimiting laterally the top portion (TP) of the internal surface (S) of the flushing water duct (4),
, wherein the bottom structure has a coupling surface (CS) configured for matching a tip surface (TS) of the protrusion (P), so that the protrusion (P) is interposed between the internal volume (3) and the flushing water duct (4).

**7.** The rimless toilet bowl (1) according to claim 6, wherein the protrusion (P) has a helical profile around the internal volume (3) and includes an inner coil (PI) and an outer coil (PO), wherein the inner coil and the outer coil delimit a portion of the flushing water duct (4),
wherein the protrusion (P) extends vertically.

**8.** The rimless toilet bowl (1) according to any of the previous claims, wherein the outlet (O) is at least partially shared between the top structure (101) and the bottom structure (102).

**9.** The rimless toilet bowl (1), according to any one of the preceding claims, wherein the inlet (I) of the flushing water duct (4) includes a first section and a second section, wherein the first section is open and connected to the inner surface (S), and wherein the second section is closed so that the water flows inside the internal surface (S) of the flushing water duct (4) in one direction only.

**10.** A toilet (100) having:

- a toilet bowl (1);
- a flushing water tank (W);
- a flushing water tube (T), configured to connect the flushing water tank (W) to the toilet bowl (1);
- a cover (C) which is hinged to the toilet bowl to cover an upper peripheral face (5) of the toilet bowl (1),

wherein the toilet bowl is according to any of the previous claims.

**11.** A method for flushing water in a rimless toilet bowl (1) comprising the following steps:

- providing the rimless toilet bowl (1) with a bottom structure (102) and a top structure (101), the top structure and the bottom structure being stably coupled together in order to form the rimless toilet bowl (1) and providing a waste receiving surface (2) defining an internal volume (3),
- connecting an inlet (I) of a flushing water duct (4) to a flushing water tube (T) for receiving flushing water from a flushing water tank (W),
- discharging the flushing water into the internal volume (3) through an outlet (O) of the flushing water duct (4), the outlet (O) being located on the waste receiving surface (2), so that the flushing water flows from the inlet (I), within an internal surface (S) of the flushing water duct (4), towards the internal volume (3),

wherein a top portion (TP) of the internal surface (S) belongs to the top structure (101) and a lower portion (LP) of the internal surface (S) belongs to the bottom structure (102), so that the flushing water duct (4) is at least partially shared between the top structure (101) and the bottom structure (102).

**12.** The method according to claim 11, comprising the following steps:

- locating the inlet (I) of the flushing water duct (4) at a rear side (R) of the rimless toilet bowl (1);
- providing the flushing water duct (4) with an end portion (E) comprising the outlet (O);
- locating the end portion (E) so its orientation with respect to the waste receiving surface (2) is such as to allow discharging the flushing water into the internal surface (S) in such a way that the flushing water, upon exiting from the outlet (O), swirls within the internal volume (3);
- discharging the flushing water into the internal volume (3) at a front side (F) of the rimless toilet bowl (1), wherein the front side (F) is opposite to the rear side (R) with respect to the internal volume (3).

**13.** A method for manufacturing a rimless toilet bowl, comprising the following steps:

- forming a top structure (101) in a first mould;
- forming a bottom structure (102) in a second mould;
- assembling the top structure (101) and the bottom structure (102) in order to form the rimless toilet bowl (1) providing a waste receiving surface (2) defining an internal volume (3);

wherein the rimless toilet bowl includes a flushing water duct (4), having:

an inlet (I), connected to a flushing water tube (T) for receiving flushing water from a water tank (W),
an outlet (O), open to the internal volume (3) for feeding the flushing water to the internal volume, and
an internal surface (S),

wherein a top portion (TP) of the internal surface (S) belongs to the top structure(1 01) and a lower portion (LP) of the internal surface (S) belongs to the bottom structure (102), and wherein the top structure and the bottom structure, when assembled, define the flushing water duct (4), so that the flushing water duct is shared between the top structure and the bottom structure.

**14.** The method according to claim 13, comprising the following steps:

- locating the inlet (I) of the flushing water duct (4) at a rear side (R) of the rimless toilet bowl (1);
- providing the flushing water duct (4) with an end portion (E) comprising the outlet (O);
- locating the end portion (E) so its orientation with respect to the waste receiving surface (2) is such as to allow discharging the flushing water into the internal surface (S) in such a way that the flushing water, upon exiting from the outlet (O), swirls within the internal volume (3);
- locating the outlet (O) of the flushing water duct (4) at a front side (F) of the rimless toilet bowl, wherein the front side is opposite to the rear side with respect to the internal volume.

**15.** The method according to claim 14 or 13, comprising the following steps:

- providing the rimless toilet bowl (1) with a protrusion (P) extending downwardly from the top structure for delimiting laterally the top portion (TP) of the internal surface (S) of the flushing water duct (4);
- providing the bottom structure with a coupling surface (CS) configured for matching a tip surface (TS) of the protrusion (P);
- coupling the protrusion (P) and the coupling surface (CS) in such a way that the protrusion (P) is interposed between the internal volume (3) and the flushing water duct (4)
- forming the protrusion (P) so it has a helical profile around the internal volume (3),
- providing the protrusion with an inner coil (PI)

and an outer coil (PO), wherein the inner coil and the outer coil delimit a portion of the flushing water duct.

Fig.1

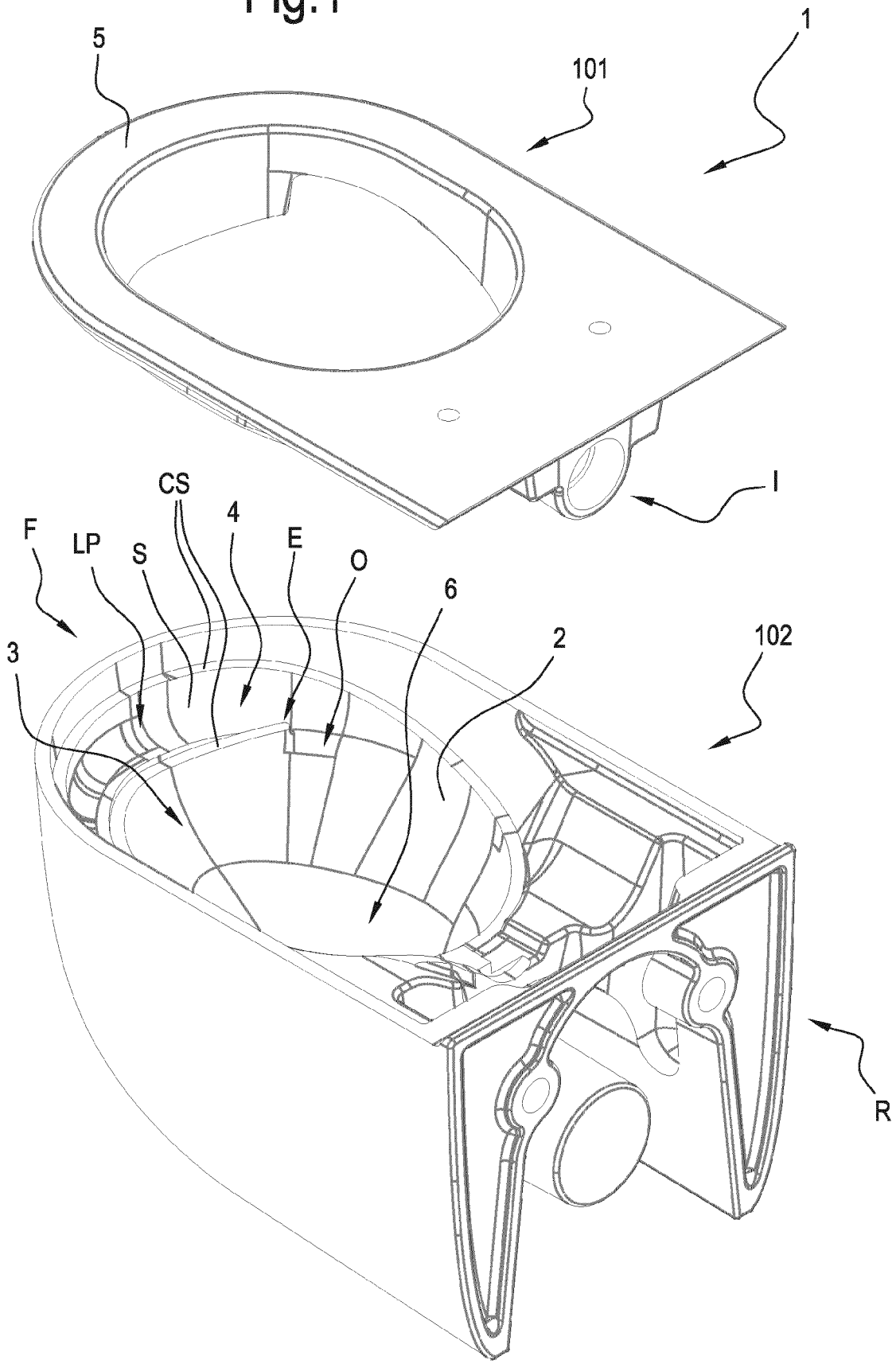


Fig. 2

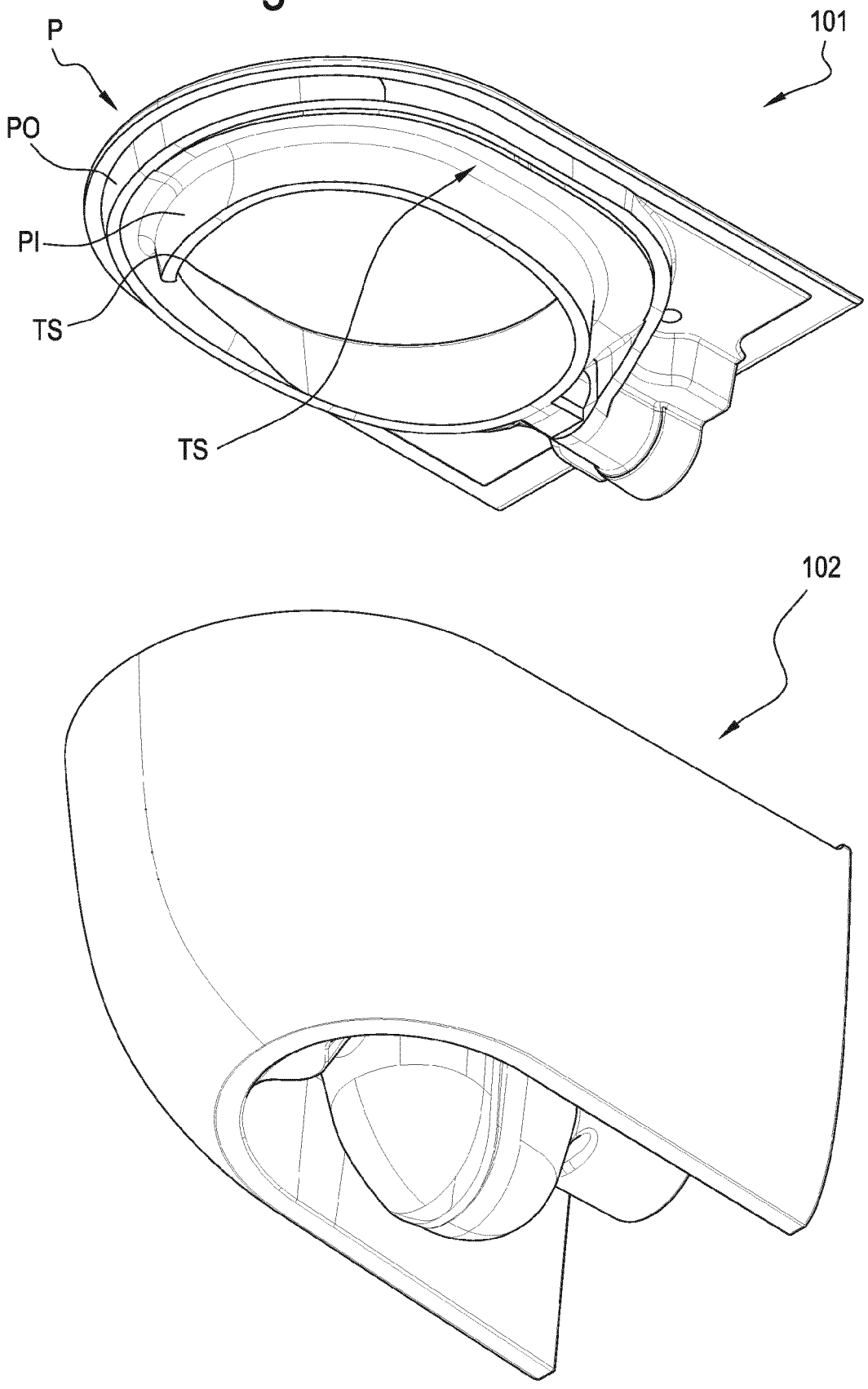


Fig. 3

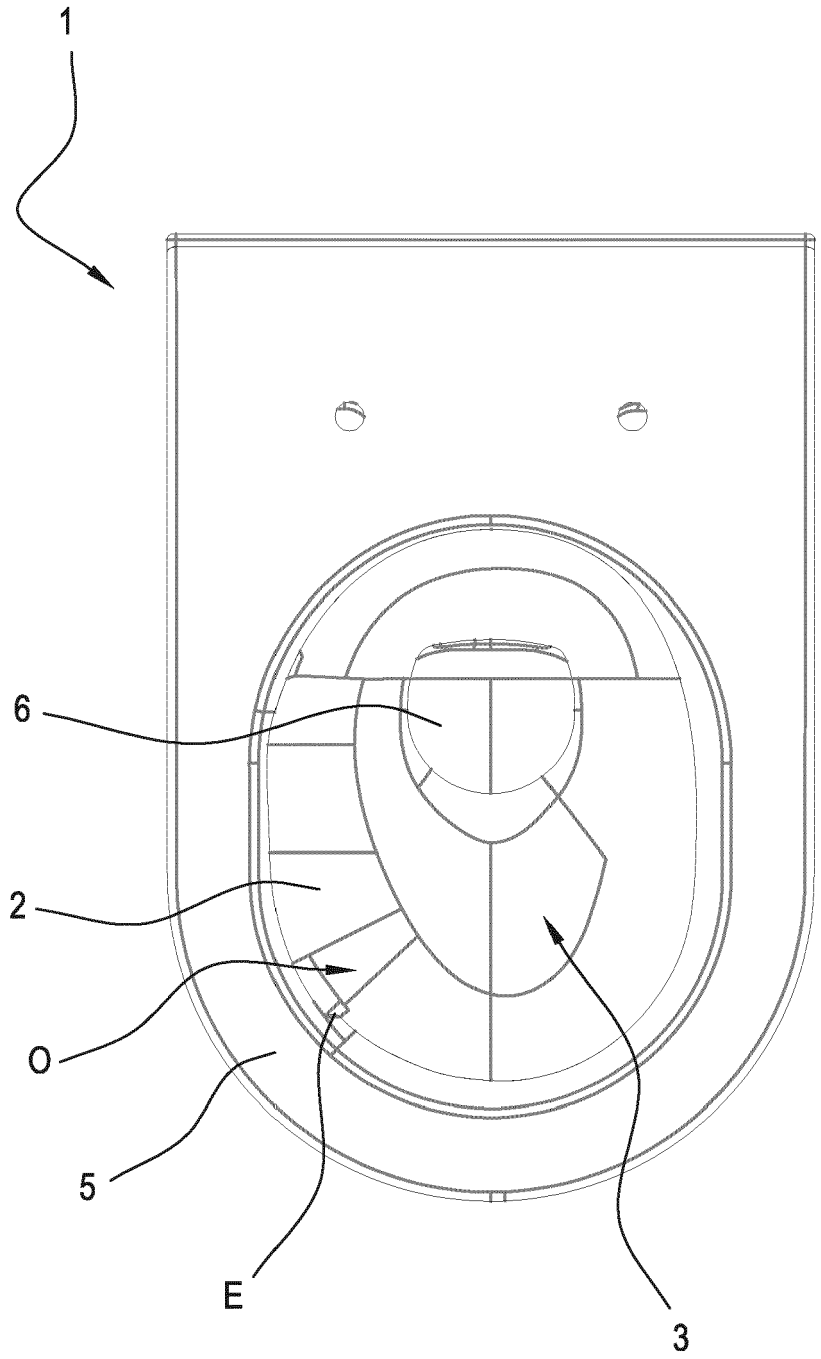


Fig. 4

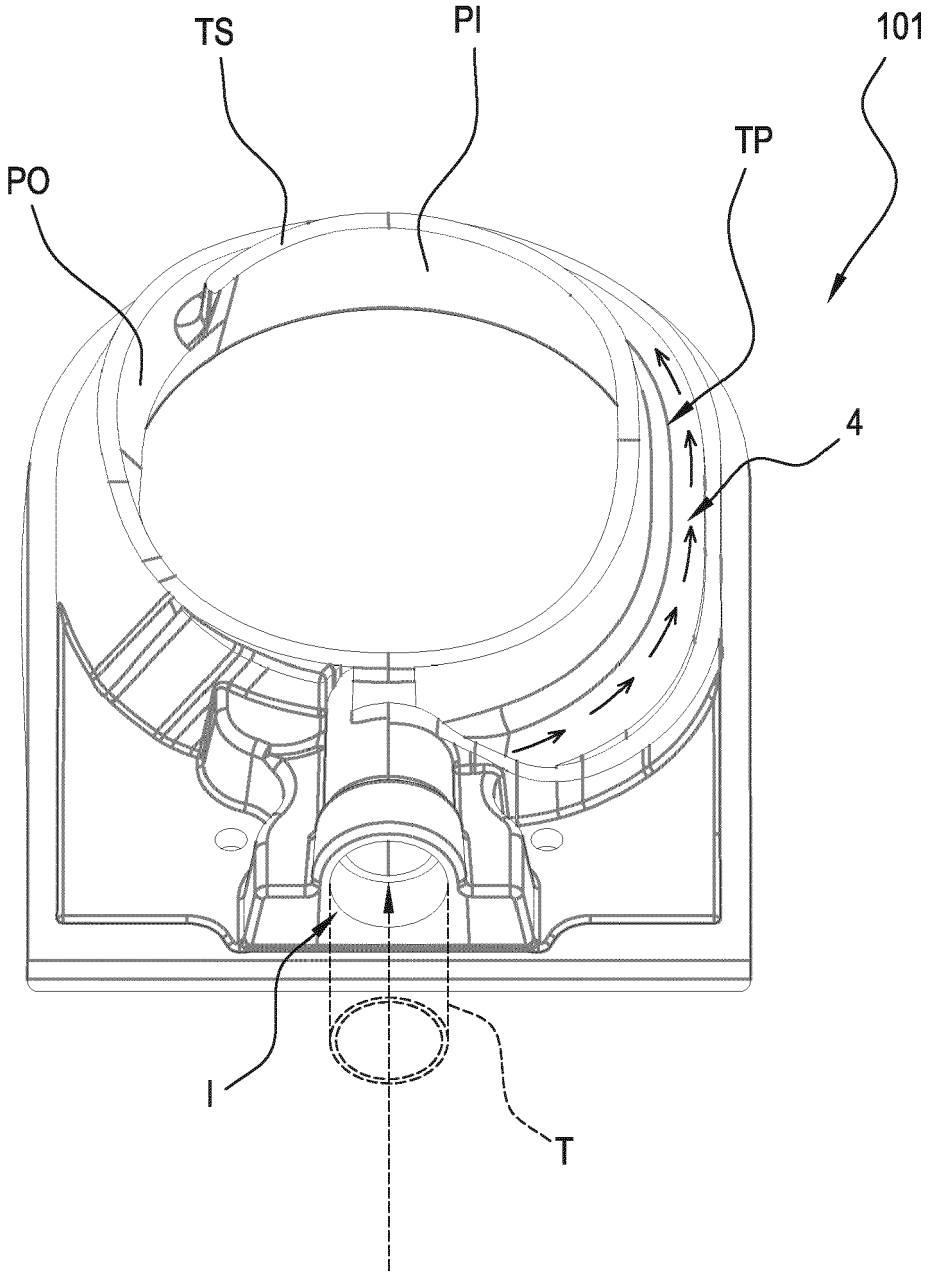
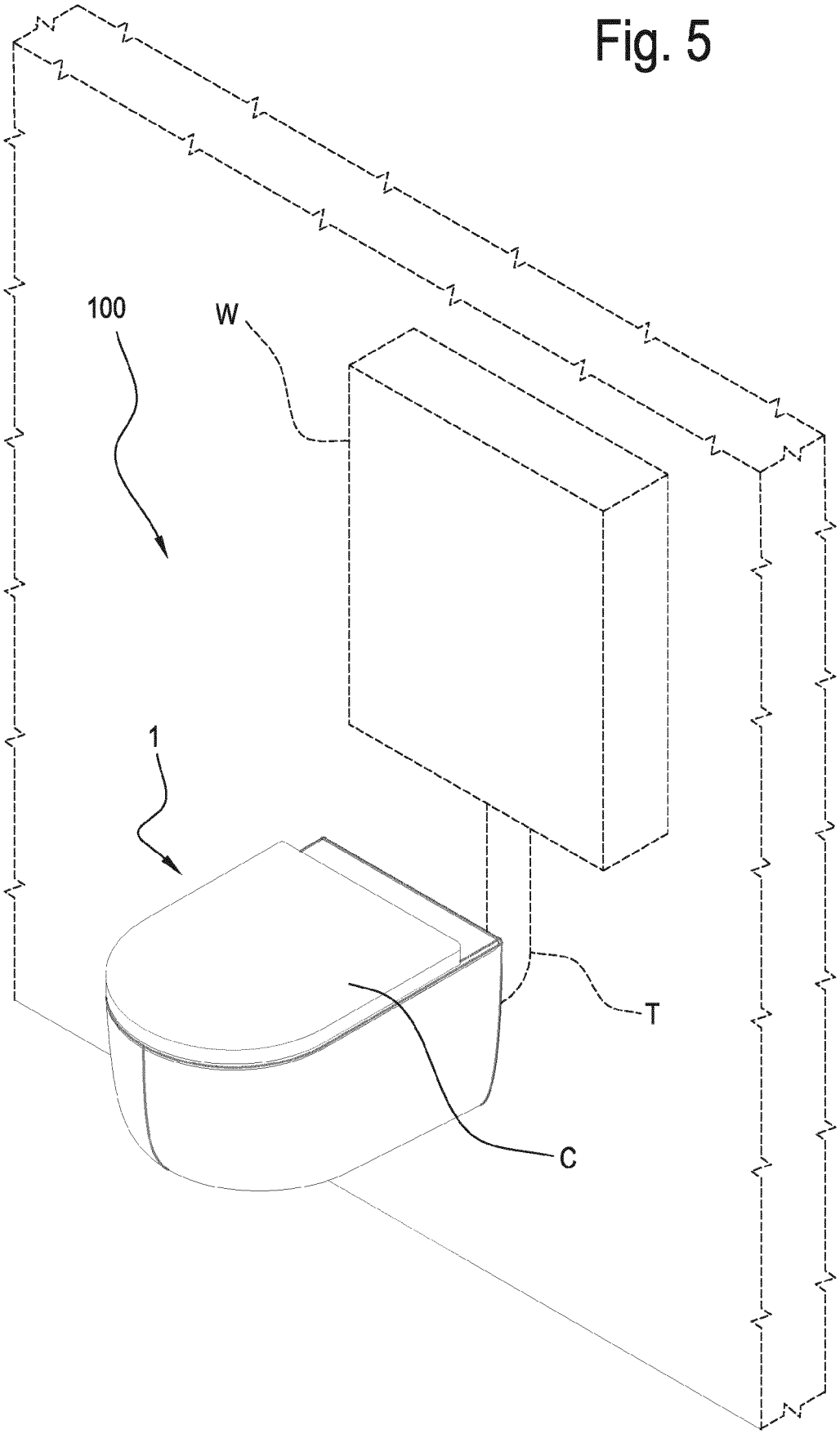


Fig. 5



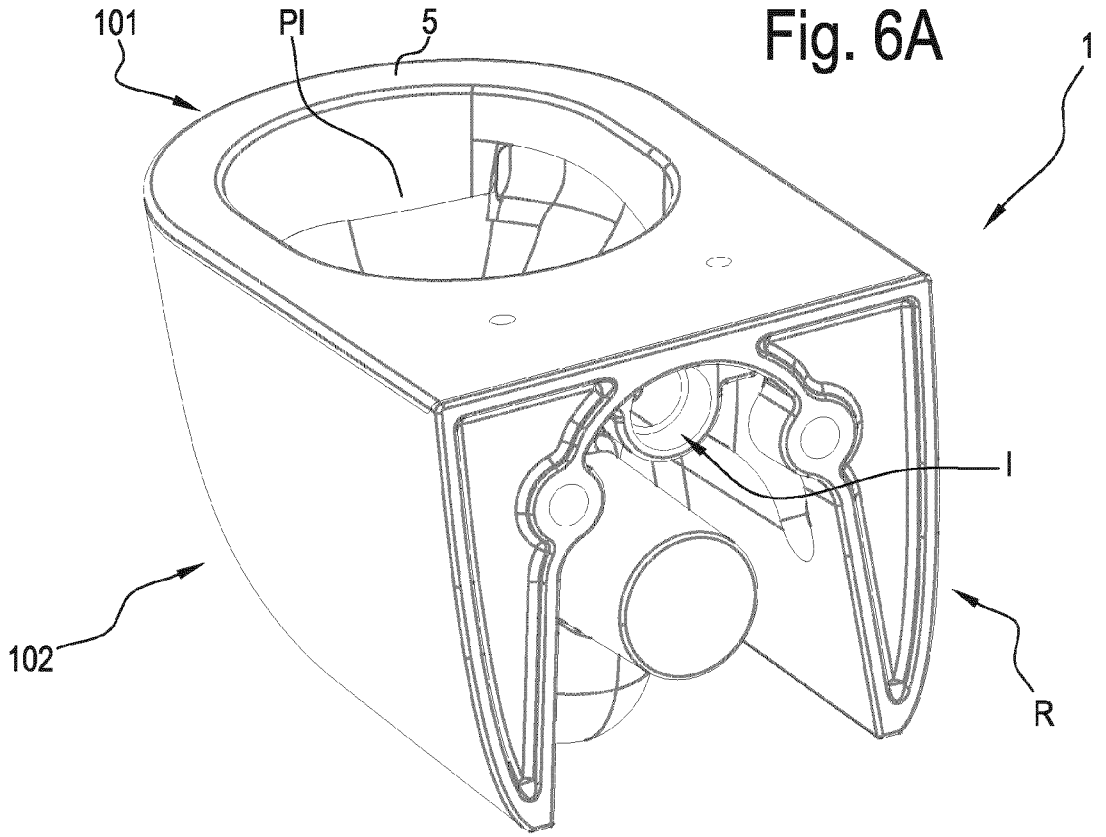



Fig. 6A

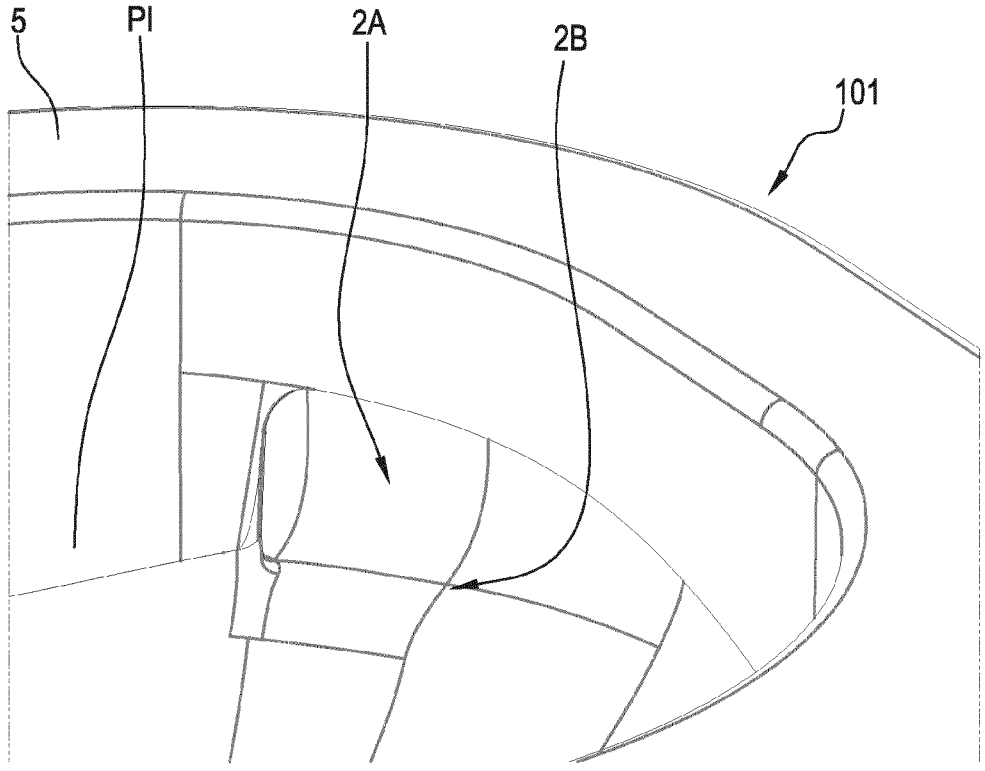



Fig. 6B

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# EUROPEAN SEARCH REPORT

Application Number
EP 23 18 6308

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