

CERAMIC FLUSH WATER DISTRIBUTOR FOR RIMLESS TOILET UNIT

FIELD OF INVENTION

- 5 The invention relates to a toilet unit. More particularly, the invention relates to a toilet unit that is capable of allowing an accurate attachment of a flush water distributor on the toilet unit to provide an efficient and effective flushing operation to a rimless toilet bowl of the toilet unit and a method for manufacturing the toilet unit.

10 BACKGROUND OF THE INVENTION

A toilet is a sanitary fixture used for defecation and urination which usually consists of a water-flushed toilet bowl and a seat. Conventional toilets typically include a rimmed toilet bowl where a rim is disposed at the top of the toilet bowl that is
15 inwardly spaced from an inner sidewall of the toilet bowl by a gap. In these conventional toilets, flush water distributes from the underneath of the rim to dispose of waste during a flushing operation. The main limitation of the conventional toilets is that the rim of the toilet bowl creates a hard-to-reach area where bacteria, limescale, grime and all manner of other nastiness can manifest as it is very difficult for a user to
20 reach into the rim and clean the area completely.

To solve the problems of the conventional toilets, toilets without the conventional rim around the toilet bowl have been developed. These toilets are called rimless toilets, which now have the whole toilet bowl exposed to the top edge where it flushes the
25 water around the toilet bowl with a superior flushing mechanism that removes the need for a rim altogether. The rimless toilets are more hygiene and are easier to clean. Since the rimless toilets do not have a rim, a water distributor is normally needed which is positioned between a flush water inlet and the toilet bowl for dividing and directing the flush water into a plurality of sub-flows around the toilet bowl. The

water distributor can be an additional system which can be later integrated or inserted into the toilet bowl or it can be part of the toilet bowl which formed together during a manufacturing process.

- 5 One exemplary technology of the water distributor of the rimless toilets can be referenced from a prior art with publication no. EP2602391A1 disclosing a plastic water distributor which is inserted into a rimless toilet bowl configured to divide inlet water into three sub-flows, where two sub-flows are directed to sides of the toilet bowl while the remaining sub-flow is directed downwardly. The plastic water distributor comprises an elongated base body having an open hollow main water duct which includes two lateral flushing water channels for generating a lateral surface flushing in the toilet bowl and a central flushing water channel that flushes a central area. The main drawback of the abovementioned plastic water distributor is that it requires a higher manufacturing cost as it is fabricated using injection moulding.
- 10 Since it is made of plastic material, the water distributor would require long-term maintenance to ensure an efficient and effective flushing operation. Furthermore, the plastic water distributor may not be installed accurately into the toilet bowl where the flushing operation may be affected. For example, the flushing force may be minimized or splashing of the flush water may occur. Besides, the plastic water distributor can only be applied in dedicated toilet bowls due to its design where the width of an inlet water channel of the toilet bowl needs to be appropriately narrow so that a strong and sufficient flush of water can be provided into the toilet bowl.
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Accordingly, it would be desirable to provide a rimless toilet unit having a flush water distributor that can be installed easily onto the toilet unit to provide an efficient and effective flushing action with a uniform water flow pattern and no splashing effect. There also exists a need for an easy and accurate method for attaching the flush water distributor with a precise fit to the rimless toilet. The proposed invention provides such a that solves the abovementioned problems.

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SUMMARY OF INVENTION

- In accordance with one aspect of the invention, there is provided a toilet unit,
5 comprising a rimless toilet bowl having a ledge that extends circumferentially around
an inner periphery wall of the toilet bowl for guiding flush water from a water supply
to at least partially or entirely a circumference of the inner periphery wall and a flush
water inlet disposed at an upper rear portion of the toilet bowl, characterized in that
the toilet bowl further comprises a recess at the flush water inlet for receiving a flush
10 water distributor that distributes the flush water to the ledge at designated directions
in such a way that the flush water can travel at least partially or entirely around the
circumference of the inner periphery wall, wherein the flush water distributor is in a
two-part form comprises an inner frame body having a shape that substantially
conforms with a surface of the recess for a firm and accurate attachment of the inner
15 frame body to the recess and an external body attached onto the inner frame body and
wherein the external body has an external surface shaped in such a way that it forms a
part of substantially integrated, uniform and continuous wall for the toilet bowl when
the flush water distributor is attached to the recess.
- 20 According to a feature of this aspect of the invention, the inner frame body can be in a
form of an open-fronted structure including a back wall having a hole configured to
engage with the flush water inlet for receiving the flush water from the water supply,
a base wall having an opening to allow a portion of the flush water flowing to an inner
rear wall of the toilet bowl and two side walls, each having an opening for allowing
25 the flush water flowing to the periphery wall of the toilet bowl.

According to another feature of this aspect of the invention, the external body can be
tilted outwardly at a predetermined angle with respect to the toilet bowl in such a way

that at least one gap is formed between the external body and the toilet bowl for allowing the flush water to the toilet bowl.

According to another feature of this aspect of the invention, the flush water distributor
5 may further comprise a flush water distribution means upon attachment of the external body onto the inner frame body including a first flush water outlet and a second flush water outlet disposed at the openings of the side walls configured to direct the flush water to at least partially or entirely the circumference of the inner periphery wall, and a third flush water outlet disposed at the opening of the bottom wall, configured to
10 direct the portion of the flush water to the inner rear wall of the toilet bowl.

According to another feature of this aspect of the invention, the first and second flush water outlets of the flush water distributor are each adjoined by the ledge in a way such that the flush water flowing out from both first and second water outlets is
15 directed to the designated directions to travel at least partially or entirely around the circumference of the inner periphery wall.

According to another feature of this aspect of the invention, the flush water flowing out from both first and second water outlets is in opposite direction to each other,
20 whereby the flush water is deflected downward and flows around an inner bottom wall of the toilet bowl when the flush water flowing out from the first water outlet and the flush water flowing out from the second water outlet meet and collide against each other.

25 In accordance with another aspect of the invention, there is provided a method for manufacturing a toilet unit, comprising the steps of casting a rimless toilet bowl having a ledge that extends circumferentially around an inner periphery wall of the toilet bowl for guiding flush water from a water supply to at least partially or entirely travel a circumference of the inner periphery wall, a flush water inlet disposed at an

upper rear portion of the toilet bowl and a recess at the flush water inlet for receiving a flush water distributor that distributes the flush water to the ledge at designated directions in such a way that the flush water can at least partially or entirely travel around the circumference of the inner periphery wall and attaching the flush water distributor onto the recess of the rimless toilet bowl, wherein the flush water distributor is in a two-part form comprises an inner frame body having a shape that substantially conforms with a surface of the recess for a firm and accurate attachment of the inner frame body to the recess and an external body attached onto the inner frame body and wherein the external body has an external surface shaped in such a way that forms a part of substantially integrated, uniform and continuous wall for the toilet bowl when the flush water distributor is attached to the recess.

According to one feature of this aspect of the invention, the flush water distributor can be clay casted by a plaster mold and/or clay casted manually.

According to another feature of this aspect of the invention, the rimless toilet bowl can be clay casted by a plaster mold.

According to another feature of this aspect of the invention, the method may further comprise the step of applying at least one layer of adhesive clay material around a connecting junction between the recess and the external body of the flush water distributor for forming the external body on the recess as the part of substantially integrated, uniform and continuous wall for the toilet bowl.

One skilled in the art will readily appreciate that the invention is well adapted to carry out the objects and obtain the ends and advantages mentioned, as well as those inherent therein. The embodiments described herein are not intended as limitations on the scope of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

For the purpose of facilitating an understanding of the invention, there is illustrated in the accompanying drawing the preferred embodiments from an inspection of which
5 when considered in connection with the following description, the invention, its construction and operation and many of its advantages would be readily understood and appreciated.

- 10 **Fig. 1** illustrates a perspective view of a toilet unit.
- Fig. 2** illustrates a perspective back view of a flush water distributor of the toilet unit.
- 15 **Fig. 3** illustrates a perspective front view of the flush water distributor of the toilet unit.
- Fig. 4** illustrates a process of attaching an inner frame body of the flush water distributor onto a recess of a toilet bowl.
- 20 **Fig. 5** illustrates a process of attaching an external body of the flush water distributor onto the inner frame body.
- Fig. 6** illustrates a process of applying one layer of adhesive clay material around a connecting junction between the recess and the external body
25 of the flush water distributor.

DETAILED DESCRIPTION OF THE INVENTION

The invention will now be described in greater detail, by way of example, with

reference to the drawings.

Fig. 1 illustrates a toilet unit **100** comprising a toilet bowl **110** according to a preferred embodiment of the present invention. According to this invention, the toilet bowl **110** is preferably a rimless toilet bowl. The toilet bowl **110** comprises a flush water inlet disposed at an upper rear portion of the toilet bowl **110** configured to supply flush water from a water supply for cleaning the toilet bowl **110** and a ledge **111** that extends circumferentially around an inner periphery wall of the toilet bowl **110** which is configured as a water passage to guide the flush water flowing from the flush water inlet to at least partially or entirely a circumference of the inner periphery wall of the toilet bowl **110**. The flush water inlet of the toilet bowl **110** is preferably connected to an outlet of a toilet cistern or a water flushing tank. Additionally, the toilet bowl **110** includes a top surface **113** with a pair of holes **114**, which are used to fasten a seat and lid thereto.

The toilet bowl **110** of the present invention further comprises a recess **112** preferably disposed at the flush water inlet for receiving a flush water distributor **120** that is configured to distribute the flush water to the ledge **111** at designated directions in such a way that the flush water can travel at least partially or entirely around the circumference of the inner periphery wall to clean the inner surrounding of the toilet bowl **110**. Advantageously, the recess **112** provided on the toilet bowl **110** acts as a reference to receive the flush water distributor **120** in order to guarantee an accurate and precise attachment of the flush water distributor **120** onto the toilet bowl **110**. The accurate and efficient attachment of the flush water distributor **120** onto the toilet bowl **110** further ensures an optimized and hygienic flushing operation having a consistent swirling water flow pattern and no water splashing problem around the toilet bowl **110**.

Referring to **Figs. 2 & 3**, a perspective back view and a perspective front view of the

flush water distributor **120** of the toilet unit **110** are illustrated. In a preferred embodiment, the flush water distributor **120** is in a two-part form comprises an inner frame body **130** having a shape that substantially conforms with a surface of the recess **112** of the toilet bowl **110** for a firm and accurate attachment of the inner frame body **130** to the recess **112** and an external body **140** attached to the inner frame body **130**. It should be understood that the design of the flush water distributor **120** can be replaced by any other suitable design. By way of example, the inner frame body **130** and the external body **140** can be formed as a single piece structure.

Preferably, the inner frame body **130** of the flush water distributor **120** is in a form of an open-fronted structure including a back wall **137** having a hole **138** configured to engage with the flush water inlet of the toilet bowl **110** for receiving the flush water from the water supply, a base wall **133** having an opening **136** for allowing a portion of the flush water flowing to an inner rear wall of the toilet bowl **110** which is below the flush water distributor **120** and two side walls **131, 132**, each having an opening **134, 135** for allowing a portion of the flush water flowing to the periphery wall of the toilet bowl **110**. It should be understood that the inner frame body **130** can be replaced with other designs, by way of example, having more or less openings to provide a more efficient and effective flushing operation to the toilet bowl **110**.

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In a more preferred embodiment, the external body **140** has an external surface **142** shaped in such a way that it forms a part of substantially integrated, uniform and continuous wall for the toilet bowl **110** when the flush water distributor **120** is attached to the recess **112** of the toilet bowl **110**. Advantageously, the flush water flowing from the flush water inlet into the inner frame body **130** is blocked by the external body **140** and an impact created against the external body **140** will distribute the flush water into multiple sub-flows to flow into the openings **134, 135, 136** provided on the inner frame body **130**. Furthermore, the external body **140** acts as a cover for covering the inner frame body **130** to improve the appearance of the overall

toilet bowl **110**. Preferably, the external body **140** of the flush water distributor can have various suitable designs. Additionally, the external body **140** of the flush water distributor **120** further comprises an inner surface **141** designed to conform with a surface of the inner frame body **130** and/or the recess **112** so that the external body

5 **140** is attached firmly on the toilet bowl **110**. By way of example, the external body **140** may comprise one or more engaging surfaces **143, 144, 145** configured to be attached and fixed onto the surface of the recess **112** for forming the external surface **142** as a part of the wall for the toilet bowl **110**. In this particular embodiment, the external body **140** is preferably tilted outwardly at a predetermined angle with respect

10 to the toilet bowl **110** in such a way that at least one gap is formed between the external surface **142** and the toilet bowl **110** when the flush water distributor **120** is attached to the recess **112** for allowing the flush water to flow to the toilet bowl **110**. Preferably, a part of the external body **140** projects out from the wall of the toilet bowl **110** after attaching the external body **140** to the recess **112** of the toilet bowl **110**,

15 wherein the projected part of the external body **140** is configured to direct the flush water to flow in a downward direction to the toilet bowl **110**.

Additionally, the flush water distributor **120** further comprises a flush water distribution means upon attachment of the external body **140** onto the inner frame

20 body **130**. The flush water distribution means includes a first flush water outlet and a second flush water outlet disposed at the openings **134, 135** of the side walls **131, 132** of the inner frame body **130** where the flush water can flow out in a first and a second flushing direction along a lateral inner periphery wall of the toilet bowl **110** to at least partially or entirely the circumference of the inner periphery wall. Preferably, the first

25 and second flush water outlets are each adjoined by the ledge **111** in a way such that the flush water flowing out from both first and second water outlets can be directed to the designated flushing directions which are the first and second flushing direction to travel at least partially or entirely around the circumference of the inner periphery wall of the toilet bowl **110**. Furthermore, the flush water flowing out from both first

and second water outlets is in opposite direction to each other, whereby the flush water circulates the circumference of the inner periphery wall of the toilet bowl **110** in the opposite direction. Initially, the flush water from the first and second water outlets first flows along the ledge **111** and it remains against the force of gravity flowing in an upper region of the inner periphery wall of the toilet wall **110**. After travelling for a certain distance from the respective water outlets, the flush water flowing out from the first water outlet and the flush water flowing out from the second water outlet meet and collide against each other. Due to the collision, swirling and turbulence of the flush water will be created and the flush water is deflected downwards and flows towards a siphon of the toilet bowl **110**. Preferably, the flush water distribution means further includes a third flush water outlet disposed at the opening **136** of the bottom wall **133** of the inner frame body **130**, configured to direct the portion of the flush water downwardly to the inner rear wall of the toilet bowl **110**. The flush water distributor **120** of the present invention advantageously control the distribution of the flush water in such a way that the splashing over the top of the toilet bowl **110** is mainly prevented while it maintains a consistent and effective flushing action with a sufficient flushing force to clean a maximum inner surface of the toilet bowl **110**.

According to the invention, the toilet bowl **101** and the flush water distributor **120** can have various suitable designs and are preferably made of ceramic material, but they can alternatively be made from other sanitary ware-suitable materials. Referring to **Figs. 4-6**, processes of manufacturing the toilet unit **100** are illustrated. According to a preferred embodiment of the invention, the flush water distributor **120** is in the form of a prefabricated component produced in a separate manufacturing process which will be integrated later into the toilet bowl **110**. The method for manufacturing the toilet unit **120** comprises the first step of casting the rimless toilet bowl **110** which comprises the ledge **111** that extends circumferentially around the inner periphery wall of the toilet bowl **110**, the flush water inlet disposed at the upper rear portion of the toilet bowl **110** and the recess **112** at the flush water inlet for receiving the flush

water distributor **120**. After casting the toilet bowl **110**, the prefabricated inner frame body **130** of the flush water distributor **120** is first attached accurately onto the recess **112** with a precise fit therein, as shown in **Fig. 4**. Next, the external body **140** of the flush water distributor **120** is then attached onto the inner frame body **130** to form the
5 complete flush water distributor **120**. Preferably, the flush water distributor **120** is clay casted by a plaster mold and/or clay casted manually and preferably, the toilet bowl **110** is clay casted by a plaster mold. In one preferred embodiment, the external body **140** of the flush water distributor **120** is further fixed onto the recess **112** of the toilet bowl **110** by applying at least one layer of adhesive clay material **146** around a
10 connecting junction between the recess **112** and the external body **140** for forming the external body **140** on the recess **111** as the part of substantially integrated, uniform and continuous wall for the toilet bowl **110**.

The present disclosure includes as contained in the appended claims, as well as that of
15 the foregoing description. Although this invention has been described in its preferred form with a degree of particularity, it is understood that the present disclosure of the preferred form has been made only by way of example and that numerous changes in the details of construction and the combination and arrangements of parts may be resorted to without departing from the scope of the invention.

CLAIMS

1. A toilet unit (100), comprising:

a rimless toilet bowl (110) having:

- 5 a ledge (111) that extends circumferentially around an inner periphery wall of the toilet bowl (110) for guiding flush water from a water supply to at least partially or entirely a circumference of the inner periphery wall, and
 a flush water inlet disposed at an upper rear portion of the toilet bowl (110);
characterized in that the toilet bowl (110) further comprises a recess (112) at the flush
10 water inlet for receiving a flush water distributor (120) that distributes the flush water to the ledge (111) at designated directions in such a way that the flush water can travel at least partially or entirely around the circumference of the inner periphery wall,
wherein the flush water distributor (120) is in a two-part form comprises an inner frame body (130) having a shape that substantially conforms with a surface of the
15 recess (112) for a firm and accurate attachment of the inner frame body (130) to the recess (112) and an external body (140) attached onto the inner frame body (130); and
wherein the external body (140) has an external surface (142) shaped in such a way that it forms a part of substantially integrated, uniform and continuous wall for the toilet bowl (110) when the flush water distributor (120) is attached to the recess (112).

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2. The toilet unit (100) according to Claim 1, wherein the inner frame body (130) is in a form of an open fronted structure including a back wall (137) having a hole (138) configured to engage with the flush water inlet for receiving the flush water from the water supply, a base wall (133) having an opening (136) to allow a portion of the
25 flush water flowing to an inner rear wall of the toilet bowl (110) and two side walls (131, 132), each having an opening (134, 135) for allowing the flush water flowing to the periphery wall of the toilet bowl (110).

3. The toilet unit (100) according to Claim 1 or Claim 2, wherein the external body

(140) is tilted outwardly at a predetermined angle with respect to the toilet bowl (110) in such a way that at least one gap is formed between the external body (140) and the toilet bowl (11) for allowing the flush water to the toilet bowl (110).

5 4. The toilet unit (100) according to any of Claims 1 to 3, wherein the flush water distributor (120) further comprises a flush water distribution means upon attachment of the external body (140) onto the inner frame body (130) including a first flush water outlet and a second flush water outlet disposed at the openings (134, 135) of the side walls (131, 132) configured to direct the flush water to at least partially or
10 entirely the circumference of the inner periphery wall, and a third flush water outlet disposed at the opening (136) of the bottom wall (133), configured to direct the portion of the flush water to the inner rear wall of the toilet bowl (110).

15 5. The toilet unit (100) according to Claim 4, wherein the first and second flush water outlets of the flush water distributor (120) are each adjoined by the ledge (111) in a way such that the flush water flowing out from both first and second water outlets is directed to the designated directions to travel at least partially or entirely around the circumference of the inner periphery wall.

20 6. The toilet unit (100) according to Claims 4 or 5, wherein the flush water flowing out from both first and second water outlets is in opposite direction to each other, whereby the flush water is deflected downward and flows around an inner bottom wall of the toilet bowl (110) when the flush water flowing out from the first water outlet and the flush water flowing out from the second water outlet meet and collide
25 against each other.

7. A method for manufacturing a toilet unit (100), comprising the steps of:
casting a rimless toilet bowl (110) having:

 a ledge (111) that extends circumferentially around an inner periphery wall of

the toilet bowl (110) for guiding flush water from a water supply to at least partially or entirely travel a circumference of the inner periphery wall;
a flush water inlet disposed at an upper rear portion of the toilet bowl (110);
and

5 a recess (112) at the flush water inlet for receiving a flush water distributor (120) that distributes the flush water to the ledge (111) at designated directions in such a way that the flush water can at least partially or entirely travel around the circumference of the inner periphery wall; and

attaching the flush water distributor (120) onto the recess (112) of the rimless toilet
10 bowl (110),

wherein the flush water distributor (120) is in a two-part form comprises an inner frame body (130) having a shape that substantially conforms with a surface of the recess (112) for a firm and accurate attachment of the inner frame body (130) to the recess (112) and an external body (140) attached onto
15 the inner frame body (130); and

wherein the external body (140) has an external surface (142) shaped in such a way that forms a part of substantially integrated, uniform and continuous wall for the toilet bowl (110) when the flush water distributor (120) is attached to the recess (112).

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8. The method according to Claim 7, wherein the flush water distributor (120) is clay casted by a plaster mold and/or clay casted manually.

9. The method according to Claim 7, wherein the rimless toilet bowl (110) is clay
25 casted by a plaster mold.

10. The method according to any of Claims 7 to 9, further comprising the step of applying at least one layer of adhesive clay material (146) around a connecting junction between the recess (112) and the external body (140) of the flush water

distributor (120) for forming the external body (140) on the recess (112) as the part of substantially integrated, uniform and continuous wall for the toilet bowl (110).