Nov. 19, 1968 N. J. PALMER 3,411,162

TOILET BOWL CONSTRUCTION

Filed Feb. 25, 1966

FIG. 1.

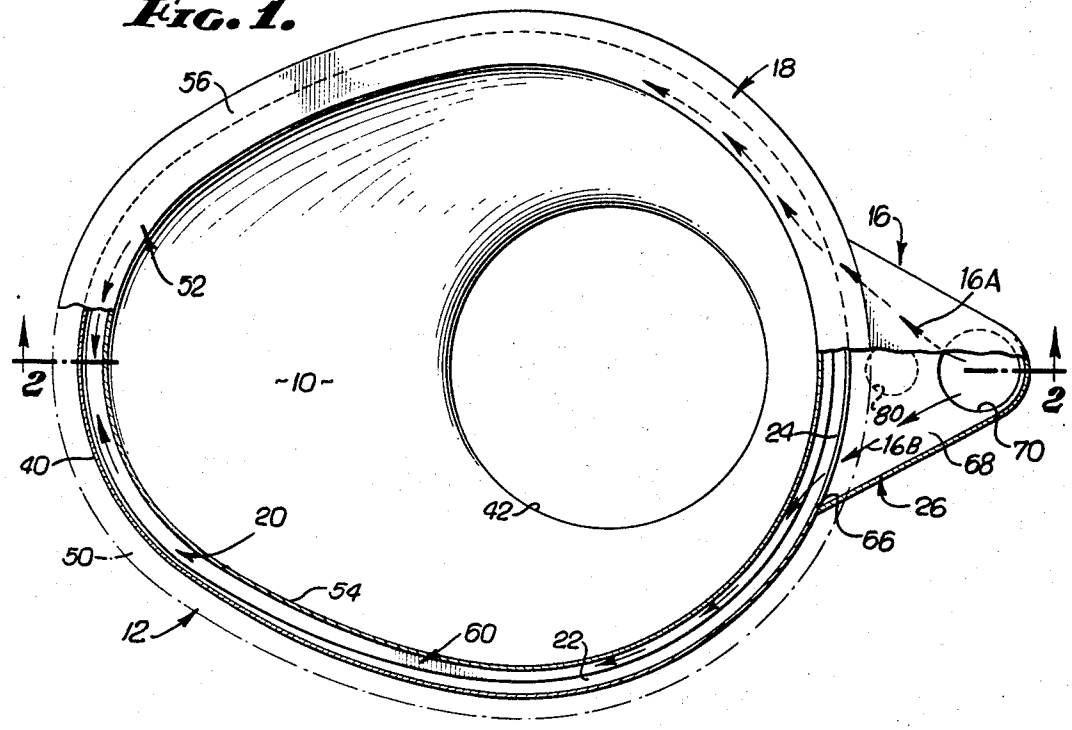


FIG. 2.

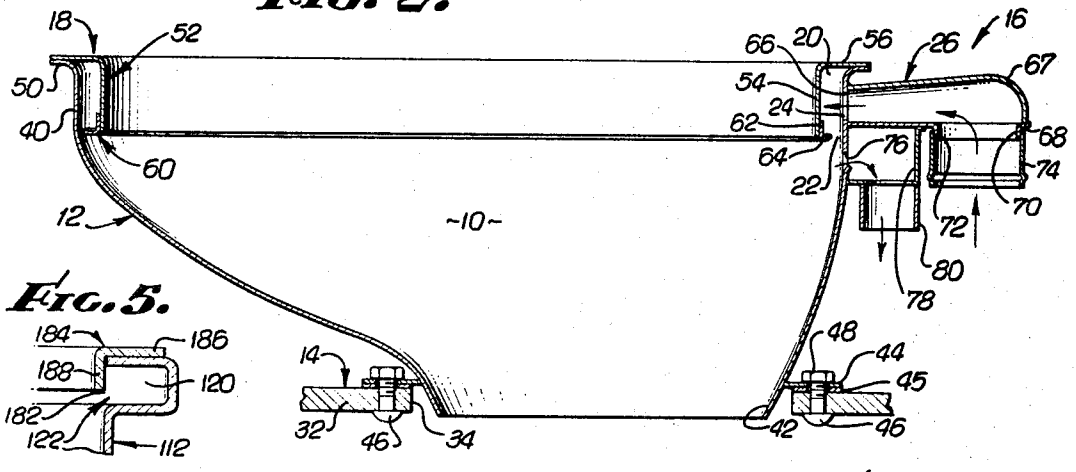


FIG. 5.

FIG. 3.

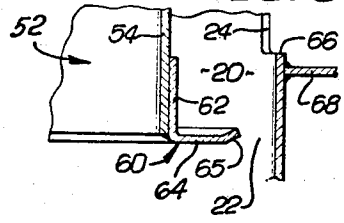
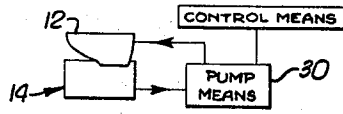


FIG. 4.



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TOILET BOWL CONSTRUCTION

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ABSTRACT OF THE DISCLOSURE

A toilet bowl has a continuous annular flushing liquid channel on its upper oval-shaped peripheral portion with a continuous annular flushing slot therein through which flushing liquid may escape and flow down the inner bowl wall in the form of a sheet of flushing liquid. The liquid is directed into the oval channel by a diverging conduit such that liquid under pressure enters in directions extending generally tangentially to said channel. The flushing slot has a width which is widest at the diverging conduit and progressively and continuously narrows in both directions around said bowl to uniformly distribute the liquid around the bowl without creating high-pressure splash-producing regions.

The present invention relates generally to a toilet bowl construction. It relates more particularly to such a construction for providing particularly effective flushing or washing of the bowl.

In toilet or sanitation systems using a liquid flush of the toilet bowl, after each use of the bowl a quantity of liquid is caused to flow into the upper portion of the bowl and then downwardly to wash waste and foreign material to the bottom of the bowl and through suitable outlet means. In a closed or recirculating toilet system, a quantity of the liquid in a tank or reservoir is recirculated to the upper portion of the bowl for flushing the bowl and for subsequent return to the tank. Heretofore, it was the practice to construct toilet bowls that provided a number of individual streams or flows of liquid to the interior of the bowl. Many toilet bowls were constructed with a perforated annular channel formed around the upper edge of the bowl; the liquid was emitted through the small holes or apertures as small individual streams or jets of liquid. There also were bowl constructions using small individual nozzles or spouts that provided individual streams or jets of liquid. Such constructions were relatively costly and failed to provide flushing or cleaning for the entire bowl surface. Certain portions of the bowl's surface intermediate the individual apertures or nozzles were not reached by the liquid, which permitted the accumulation of waste material as well as germs and bacteria.

It is an object of the present invention to provide a novel and improved toilet bowl construction.

It is a further object of the present invention to provide such toilet bowl construction which includes flushing means for highly effective flushing of the bowl.

Another object of the present invention is the provision of such toilet bowl construction which is simple and economical to produce and maintain yet which is durable and dependable.

Other advantages and objects of the present invention will become more apparent from the following description and the accompanying drawings, wherein:

FIGURE 1 is a plan view, with parts broken away and in section, of a toilet bowl construction for a self-contained recirculating aircraft toilet system which embodies various features of the present invention;

FIGURE 2 is a side sectional view taken generally along line 2—2 of FIGURE 1;

FIGURE 3 is an enlarged view of a portion of FIGURE 2 showing part of the flushing channel and slot of the illustrated construction;

FIGURE 4 is a diagrammatic representation of portions of the system; and

FIGURE 5 is a side sectional view of a modified form of toilet bowl construction.

Briefly, the illustrated toilet bowl construction **10** comprises a toilet bowl **12** adapted to be supported by a liquid-holding tank **14** for discharging into the tank. Bowl **12** supports flushing means **16** that includes a ring structure **18** which defines a flushing channel or manifold **20** around the upper edge of the bowl. The channel **20** has an outlet in the form of a continuous flushing or discharge slot **22** that extends completely around the upper edge of the bowl. One side of the slot **22** is formed by the wall of the bowl and there is an elongated inlet **24** through the bowl wall above the slot leading into the channel. A diverging distributor **26** directs liquid under pressure from the tank **14** into the channel through the inlet **24** each time the toilet is flushed. Such liquid flows in paths indicated generally at **16A** and **16B** which as illustrated extend in directions generally tangential to the flushing channel **20**.

The tank or receptacle **14** is adapted to hold a quantity of liquid chemical solution and to receive, incident to use of the toilet system, additional liquid waste, solid waste and foreign material and objects. The tank **14** is constructed of a suitable corrosion and rust resistant material. As noted generally above, after each use, the bowl is flushed or washed by a quantity of relatively clear liquid which is recirculated from the tank into the upper portion of the bowl so as to flow down and around the interior of the bowl to carry waste and foreign material back to the tank. As shown in FIGURE 4, the bowl **12** is mounted atop the tank **14**, and pump means **30** is operatively connected between the tank and the bowl for delivering liquid under pressure from the tank to the upper portion of the bowl. Manually actuated control means **31** controls the operation of the pump means **30** to flush the toilet.

As shown best in FIGURE 2, the tank **14** includes an upper wall **32** having a generally circular aperture or opening **34** for receiving the lower portion of the bowl. The illustrated toilet bowl **12** is constructed of a suitable, strong, durable, corrosion-and-rust-resistant material, such as various metals, and is provided with a generally smooth and highly polished inner surface. At its upper edge **40**, the illustrated bowl **12** is generally elliptical or egg-shaped in horizontal section, with its larger portion disposed rearwardly. The bowl **12** then converges inwardly toward its lower portion where it forms a discharge opening or aperture **42** at its bottom adjacent the rear of the bowl. As shown best in FIGURE 2, the wall of the bowl converges to the greatest extent from its forward edge where it slopes first downwardly, then rearwardly, and finally downwardly. An annular mounting flange **44** is secured around the outside of the lower portion of the bowl as by welding. The mounting flange **44** rests upon the upper tank wall **32** so that the lower end of the bowl defining the discharge opening **42** extends downwardly through the aperture **34** in the tank wall. A suitable gasket **45** is provided between the flange **44** and the tank wall **32**, and the bowl is held in place as by bolts **46** and nuts **48**, passing through the flange **44** and the wall **32**.

The upper edge of the bowl **12** is formed or turned outwardly into a generally horizontal peripheral flange **50**.

As noted above, the flushing means **16** comprises the ring structure **18**. The illustrated ring structure **18** includes an annular upper ring **52** which is generally the same elliptical shape as the upper edge of the bowl and has a generally inverted L-shape in vertical section. The ring **52** has a vertically extending annular section or wall **54**

integrally joined at its upper edge to the inner edge of a horizontally extending section or wall **56**. The horizontal wall **56** is secured at its outer edge to the peripheral flange **50** of the bowl so as to support the vertical wall **54** generally parallel to and inwardly spaced from the adjacent wall of the bowl.

An annular lower ring **60** which is also generally the same elliptical shape as the upper edge of the bowl and is generally L-shaped in a vertical cross-section, is secured to the upper ring **52**. The lower ring **60** includes a vertically extending annular wall or section **62** and a horizontally extending wall or section **64** integrally formed with and extending outwardly from the lower edge of the vertical wall **62**. The vertical wall **62** is secured to the outwardly facing surface of the upper ring wall **54**. The horizontal wall **64** extends outwardly toward the adjacent wall of the bowl. The innermost edge of the horizontal wall **64** is formed or turned upwardly slightly, as shown best in FIGURE 3, and defines a lip **65**.

The space defined between the lip **65** and the adjacent inner surface of the bowl comprises the discharge or flushing slot or orifice **22**. The rings **52** and **60** as well as the bowl itself define the annular channel **20** which, in the illustrated structure, extends completely around the upper edge of the bowl. The illustrated flushing slot **22** also extends completely around the upper edge of the bowl, being formed in part, as noted above, by the inner surface of the bowl wall. Thus, flow from the flushing channel **20** through the slot **22** and down the bowl is unobstructed, permitting virtually the entire surface of the bowl to be washed by the liquid.

The width of the slot **22** is varied around the bowl to distribute the water around the bowl, as will be explained in more detail.

At the rear of the bowl an elongated slot or opening **66** is provided in the bowl wall above the flushing slot **22**. The opening **66** provides the inlet **24** for liquid to the channel **20**. The illustrated inlet opening **66** extends for a substantial distance along the channel as shown in FIGURE 1.

The diverging distributor **26** is secured to the bowl and disposed immediately outwardly of the inlet opening **66** so as to provide communication from the pump means **30** to the channel **20**. The distributor **26** is a generally flat configuration, being wide at the inlet opening **66** and converging or narrowing as viewed in plan as it extends outwardly. While the distributor **26** thus diverges outwardly to the sides as it extends inwardly to the inlet opening **66**, its height converges or shortens as it approaches the inlet opening **66** as shown best in FIGURE 2. The foregoing configuration of the distributor **26** helps to maintain the desired pressure and flow to the channel. The illustrated distributor **26** is constructed of a flushing elbow **67** and a lower flushing plate **68**. The distributor is opened at its inward end so as to communicate with the inlet opening **66**. At its outer end the distributor **26** is provided with a generally circular aperture **70** through the lower flushing plate **68** and with a downwardly extending circular flange or rim **72**. A tubular flushing tube or conduit **74** is secured on the rim **72** and adapted to connect to a suitable pipe or hose (not shown) leading from the pumping means **30**. The inlet opening **66** and the distributor **26** are proportioned so as not to limit or throttle the predetermined flow of fluid from the delivery line from the pumping means to the channel. More particularly, the inlet opening **66** and distributor **26** have larger areas in flow cross section than do the conduit **74** and the pump delivery hose.

When the toilet is flushed, liquid under pressure is forced by the pump means **30** up through the flushing tube **74**, the diverging distributor **26**, and the inlet opening **66** to the rear portion of the flushing channel **20**. The bowl construction is so proportioned and arranged and there is sufficient liquid flow and pressure to cause liquid to flow in both directions around the channel **20** while

also permitting liquid to flow downwardly through the flushing slot **22** in a swirling or flushing motion down and around the inside of the bowl. This washes or scours the inside of the bowl, carrying foreign and waste material down through the discharge aperture **42** into the tank **14**. As noted above, the size or width of the flushing slot **22** varies at different places around the periphery of the bowl. The slot width is largest at the rear of the bowl adjacent the inlet **24** and decreases in size in both directions around the bowl to a minimum width at the forward end of the bowl. This variation in the size of the slot **22** contributes to the desired flow or flushing pattern of liquid from the channel down and around the bowl. In general, a relatively large amount of liquid enters the bowl at its rearward portion, moving forwardly and downwardly around the bowl. There is substantially less flow from the forward portion of the slot, although there is sufficient flow to insure that the entire inner surface of the bowl is washed or flushed, but without any high pressure areas which produce undesired splashing. The slot width may be varied to provide, in conjunction with the gallonage and pressure of the particular pumping means, a generally full uniform flow of liquid over the entire bowl without splash problems.

Satisfactory results have been achieved with the illustrated flushing slot which is about .25 inches wide adjacent the inlet **24** and about .07 inches wide at the front of the bowl. The slot width at either side approximately midway between the front and the back is about .18 inch The slot width at either side at about ¾ of the distance rearwardly is about .23 inch and at about ¼ of the distance rearwardly is about .09 inch. The illustrated apparatus operates at about 0.07 p.s.i. and delivers about 16 gallons per minute. While flush time may vary, the illustrated bowl is effectively cleaned with a flush time or duration of about 10 seconds which causes approximately 2.6 gallons of liquid to be flushed.

Located below the inlet opening **66** at the rear of the bowl is an overflow aperture **76** through the bowl wall. An overflow receiver or elbow **78** is secured to the bowl outwardly of the aperture **76** and is connected to a downwardly directed overflow tube **80** which is adapted to connect to a suitable overflow line (not shown) leading to the exterior of the system.

Thus, the bowl construction **10** provides a slot which extends continuously around the bowl without interference or obstruction. This is an important feature as even the smallest support in the nature of .040–.060 inch across will produce a noticeable triangular void area in the flush or flow pattern where germs and bacteria can accumulate. When the construction is flushed, the flow is distributed over the entire bowl surface and there are no undesirable high pressure areas producing splashing.

FIGURE 5 illustrates a modified form of toilet bowl construction where the upper edge of a toilet bowl **112** is formed outwardly and then back inwardly to define an annular inwardly-facing recess **182**. An annular ring **184** having a generally inverted L-shaped vertical cross-section and a configuration generally matching the elliptical shape of the upper edge of the bowl is secured to the bowl upper edge. The ring **184** includes a horizontally extending wall or section **186** mounted on the bowl upper edge and a vertically extending annular section or wall **188** integrally joined to the inner edge of the wall **186** so as to extend downwardly to partially close the recess **182**. The ring **184** and the upper edge of the bowl **112** thus form an annular flushing channel **120** having a continuous annular flushing slot **122**.

Various modifications and changes may be made in the illustrated structure without departing from the spirit and scope of the present invention. For example, but not by way of limitation, the flushing channel and slot may be constructed in a number of different ways as may the construction and arrangement of the inlet and the distributor to the channel.

Various features of the present invention are set forth in the following claims.

What is claimed is:

1. A toilet bowl construction comprising a toilet bowl having an annular peripheral portion, means adjacent to said peripheral portion and defining an annular oval flushing channel extending around the upper end of said bowl, said channel having a continuous annular flushing outlet extending around said bowl, means defining an inlet to said channel for introducing liquid into said channel to flush said bowl, said channel being formed in relation to said inlet to direct liquid from said inlet along the channel so that a substantial amount of liquid enters said channel at different spaced regions along said channel and in directions which extend generally tangential to said annular oval flushing channel.

2. A toilet bowl as set forth in claim 1 in which said means for introducing liquid includes a distributor having a liquid inlet port and a liquid outlet port intercommunicated by conduit means, said conduit means having a first pair of opposite wall portions which diverge outwardly from said inlet port to said outlet port and a second pair of opposite wall portions which converge outwardly from said inlet port to said outlet port, said outlet port being in communication with said inlet to said channel, said diverging walls each extending in a direction which makes an acute angle with said channel where they meet.

3. A toilet bowl as set forth in claim 2 in which said distributor is in the form of an elbow and said inlet port is generally circular and adapted to receive a hose.

4. A toilet bowl as set forth in claim 3 in which said inlet port has a cross-sectional area less than the cross-sectional area of said outlet port and said inlet to said channel.

5. A toilet bowl construction as set forth in claim 1 in which said annular flushing channel includes an annular ring portion having an annular lip portion which extends upwardly into said channel and defines an annular edge of said flushing outlet.

6. A toilet bowl construction as set forth in claim 2 in which said upper peripheral portion and said annular flushing channel is mounted on the back portion of said bowl, and said flushing outlet being widest at said inlet and continuously narrowing in both directions around said bowl to distribute liquid around the bowl without creating high-pressure splash-producing areas.

7. A toilet bowl construction as called for in claim 1, with said flushing outlet being widest at said inlet and generally proportionally narrowing in both directions around said bowl to distribute liquid around the bowl without creating high-pressure splash-producing areas.

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