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(54) **Toilet bowl with flush flow control**

(57) The present utility model refers to an embodiment introduced in horizontal toilet bowls with control of the flow of the flushing water by means of an electric pump system, solenoid valves for flow control and an electronic device.

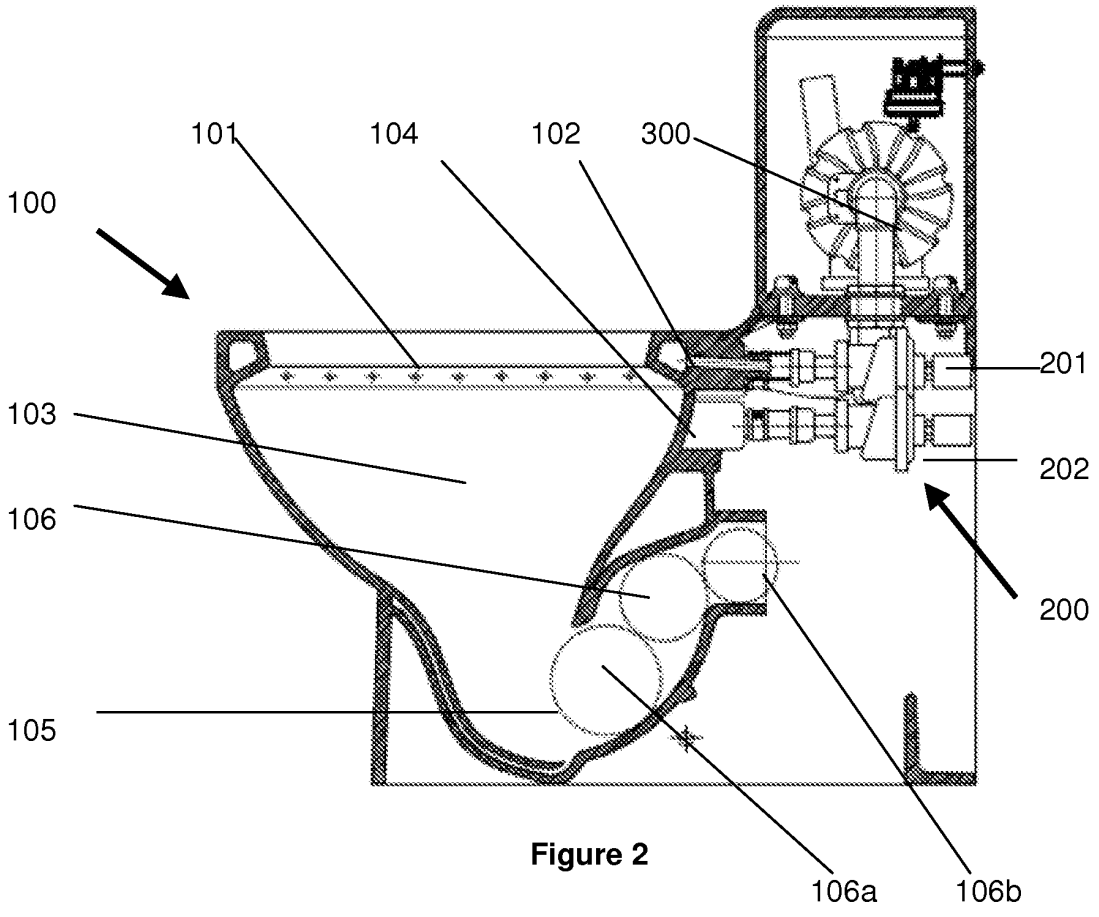

Figure 2

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Description

[0001] The present invention refers to horizontal toilet bowls with control of the flow of the flush by means of an electric pump system, solenoid valves for flow control and an electronic device.

State of the Art

[0002] The first devices used by human beings to discharge human waste, such as urine, feces and others, were created as soon as the first large-scale human settlements were formed. Until the mid-19th century, the main devices used for this purpose had seats with holes directly conducting the excrement to sewers and sinkholes directly excavated in the soil.

[0003] With the advent of forced water conduction systems, more efficient devices for this purpose had to be created, especially due to the verticalization of human settlements in general.

[0004] Created in England by the end of the 19th century under the name of water closet, toilet bowls, together with water and sewer facilities in buildings, constituted a technological improvement, allowing human beings to improve sanitary conditions in urban centers, thus improving the population's quality of life.

[0005] Toilet bowls are anatomic receptacles provided with a given quantity of water intended to receive human bodily wastes (urine, feces, etc.) and an internal device to remove them by means of a water flow.

[0006] The flow of water is generally provided by a flushing device that supplies the toilet bowl with water in appropriate volume and speed not only to remove the matter in the bowl, but also to horizontally push it through the sewage tubes to the vertical tube of the building facility.

[0007] Toilet bowls may be configured to work by the principles of siphoning or dragging.

a. Toilet bowls with siphoning action

[0008] In toilet bowls with siphoning action, flush water is introduced into the bowl by means of a distribution collar located at the upper part of the bowl. Guided by the sloping of the bowl walls, the flow of water converges to the bottom of the bowl. The resulting hydrodynamic energy of the volume and flow of the flush moves the mass constituted by the liquids and solids deposited inside the bowl, sending them to the siphon located inside the bowl.

[0009] The siphoning process pushes the contents off the bowl through the sewer pipes located below the floor.

[0010] For bowls with siphoning action to be effective with reduced volumes of water, the size of the water well inside the bowl and the diameter of the siphon must be reduced. By reducing the size of the siphon, the capacity of the bowl to let larger solid waste go through is directly reduced, with the consequent increase in the risk of undesirable clogging.

[0011] Low consumption toilet bowls with siphoning action coupled to flush tanks with reduced flow (1.4 l/sec) work near the limits of use by frequently leaving annoying disposed matter after the flushing, thus requiring a second flushing to fully clean the bowl.

[0012] For this kind of bowl to work appropriately, water must be supplied by a flush tank located in a higher position, able to supply a flow of at least 1.7 l/sec.

b. Drag toilet bowls:

[0013] In this kind of bowl, the bodily waste is directly expelled from the bowl well to the sewage system by means of a large diameter pipe, which allows the free passage of the mass of liquid and solid waste, independently of their nature, volume or density.

[0014] The transfer of the waste from the toilet well to the drainpipes is solely made by the hydrodynamic energy coming from the water flush applied in the process.

[0015] For this kind of bowl to work efficiently, the speed of the water must be between 1.7 and 2.2 liters per second. The higher the pressure of the flow, the larger the capacity of solid removal from the well of the bowl. The higher pressure of the flow, the better the horizontal flow of sewage to the vertical pipe and the better the general performance of the system.

[0016] Drag toilet bowls with low consumption (6 liters) should therefore be coupled to cisterns installed in a high position to provide high flow flushes (1.7 to 2.2 l/sec) (source: http://www.forumdaconstrucao.com.br /conteudo.php?a=24&Cod=39). Both kinds of bowls require a reasonable volume of water to fully drag the waste material in them.

[0017] Since water is a limited natural resource (less than 2% of the all the water on the planet is available for immediate use by human beings), we verified the need to reduce the water consumption of flush toilets.

[0018] International rules, such as the European rule and the Brazilian rule, have been adapted to this reality, more and more requiring that the water volumes used in the flush devices be reduced and controlled.

[0019] The need to control and reduce the volume of water used in flush toilets practically eliminated the possibility of use of direct flush valves such as the ones used in the recent past. Various flush devices have been created through time to control the flush in order to maximize their efficiency with the lowest possible volume of water.

[0020] Among these devices, we highlight electric pump assisted devices, especially in drag toilet bowls, to maximize efficiency with the lowest possible volume of water.

[0021] Various enhancements have been proposed.. As an example, US patents US 5926863 and US 2007277302 improve the drag system by using parallel systems to better adequate the flow of water. Other enhancements proposed are the American patent US 4918764 and the Brazilian patent MU 7200798-2 that try

to improve the flush by means of electric flushing devices.

[0022] The author of the present application also owns various patent applications in this field, including Brazilian patent application MU 8601167-7, which has an electronic water flush control set.

[0023] All applications and/or patents mentioned here as examples present some specific problem. Such applications and/or patents do not provide a continuous and efficient flush, or they do not provide a minimum flush volume, or they cause discomfort to users by sprinkling used water when flushed, spreading germs in the environment.

Summary of the Invention

[0024] The object of the present invention is to present a flushing system that ensures full control of the water flow used in the flush, with a minimum volume of water, without causing inconveniences such as sprinkling during the flushing process.

[0025] Said objective is reached by a system constituted of a bowl provided with an electric pump and valve set that control the volume of water efficiently, being said bowl provided with specific geometry that uses said water flow more effectively, without causing the dispersion of infecting droplets in the ambient.

[0026] Furthermore, the present invention is provided with a system that controls the flow of water used, since it has two stages of water flushes, a first one with lower volume for liquid excrement and a second one for solid excrement.

Description of Drawings

[0027] The present utility model application will be better understood in the light of the attached figures, shown here as mere examples, without limiting the scope of the present invention, wherein:

- Figure 1 is an upper view of a toilet bowl of the state of the art;
- Figure 2 is a section view of the proposed bowl with valves and electric pump;
- Figure 3 is an upper view of the proposed bowl with valves and electric pump; and
- Figure 4 is an upper view of an alternative of the proposed bowl with valves and electric pump.

Description of a Main Embodiment

[0028] The present utility model will be disclosed based on the attached figures, wherein letter A shows the toilet bowl set including a toilet bowl (100), a set of valves (200) and an electric pump (300).

[0029] The bowl (100) has an upper rim or "ring" (101) through which a part of the full volume of water required for each flushing operation in the bowl is injected. In the direction of the ring (101), there is a duct (102) through which said partial volume of water is injected. In the well (103), there is a second injection duct (104) through which another part of the volume of water required for a flushing procedure is injected. At the bottom of the well (103), there is a hole (105) that communicates with the passage duct (106) which, on the other hand, is connected to the sewer network (not shown). The passage duct (106) has such geometry that its initial section (106a) is longer than the final section (106b), generating a duct with *Venturi* characteristics, speeding up the movement of the water and therefore facilitating the full flush of the water injected in the well (103).

[0030] Coupled to the bowl (100), there is the set of valves (200), constituted of an upper valve (201) and a lower valve (202). The upper valve (201) has an outlet which is coupled to the duct (102), while the lower valve (202) is coupled to the duct (104).

[0031] The set of valves (200) is fed by an electric pump (300) which may or may not be immersed in a flush tank (Figures 3 and 4). The set of valves (200) and pump (300) is controlled by an electronic system (not shown), e. g. a double solenoid electrical diaphragm valve, which allows the electric pump (300) to feed only one valve or the other (201, 202) or both valves simultaneously.

[0032] The operation of the system is simple and consists of the actuation of the flush by the electric valve. After its operation is started:

1. the upper valve (201) opens and the electric pump (300) sucks the water directed by the duct (102) in enough volume to clean the ring (101) and inside the well (103);
2. the upper valve (201) closes, while the lower valve (202) opens, and through the duct (104), directs the water to the well (103) by the duct (104), and this volume causes the exit of the excrement through the hole (105) which communicates with the duct (106) that takes the excrement out of the bowl (100); and
3. the lower valve (202) closes and the water is again re-directed to the upper valve (201), forcing the water through the ring again (101) and recomposes the water seal of the bowl (100).

[0033] Optionally, if the water network supply is reliable, the flush tank coupled to the toilet bowl may be excluded. The electric pump receives the water directly from the pre-installed supply network. In this case, the electric pump should have inlet and outlet pipes in such dimensions that the pump will not work dry, having uniform pressure along the process.

[0034] The present invention is highly efficient in the limitation of the water used in the flushing process, and is also more hygienic, since:

- it has an electric pump and valves that make better use of the supplied water;
- it works in alternate cycles, which controls the volume of water that arrives at once at the well of the

bowl, thus avoiding the water to spread; and

- it is more hygienic due to its several washing steps.

Claims

1. Toilet bowl with flush flow control including a toilet bowl (100), a set of valves (200) and an electric pump (300), **characterized by** the fact that the bowl (100) has an upper rim (101) provided with an injection duct (102) and a well (103) provided with a second injection duct (104), being said well (103) provided with a hole (105) communicating with the passage duct (106); said passage duct (106) having an initial section (106a) which is longer than the final section (106b), generating a duct with Venturi characteristics.

2. Toilet bowl, according to claim 1, **characterized by** having, coupled to the bowl (100), the set of valves (200) constituted of an upper valve (201) connected to the duct (102) and a lower valve (202) connected to the duct (104).

3. Toilet bowl, according to claim 1, **characterized by** the fact that the set of valves (200) is fed by an electric pump (300) which may or may not be immersed in a flush tank and be controlled by an electronic system.

4. Toilet bowl, according to claim 1, **characterized by** the fact that the set of valves (200) is a double solenoid electric diaphragm valve or another one with the same function.

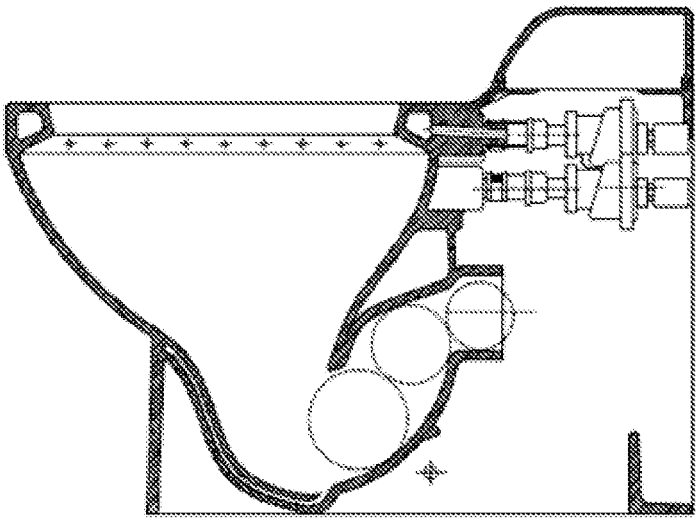

Figure 1 (STATE OF THE ART)

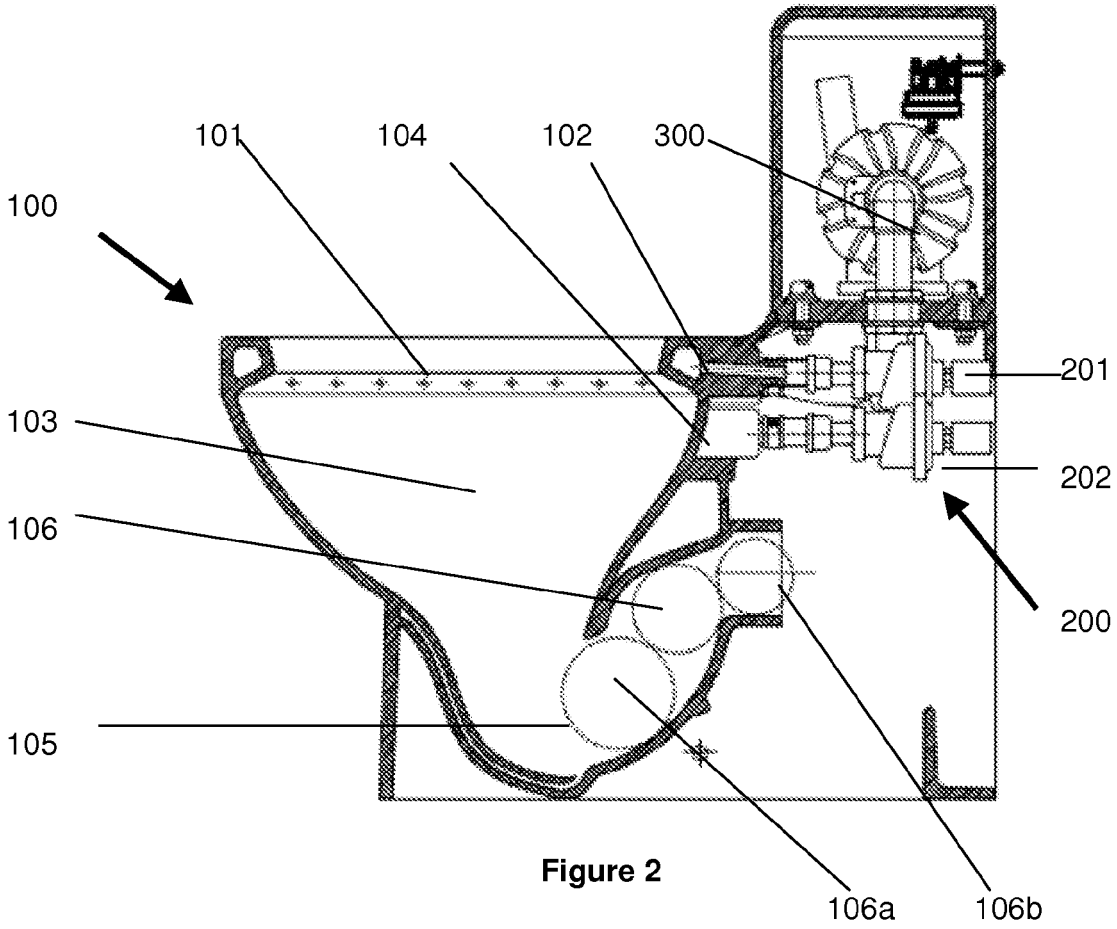

Figure 2

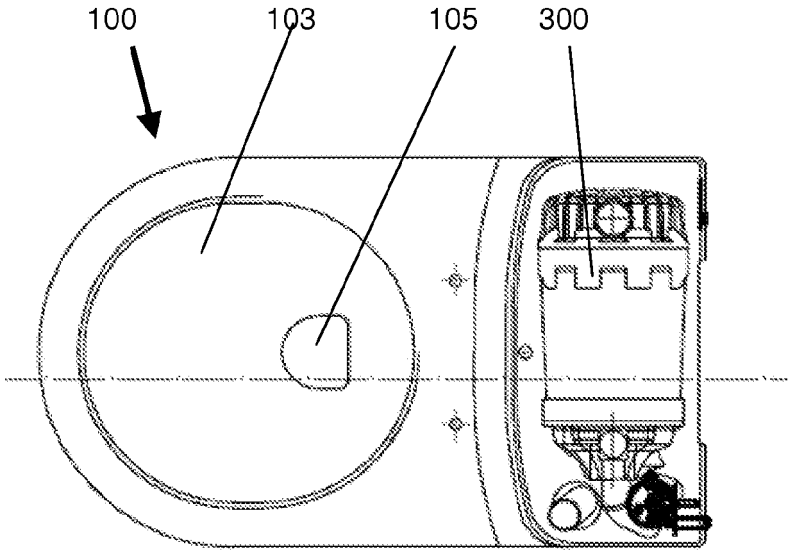

Figure 3

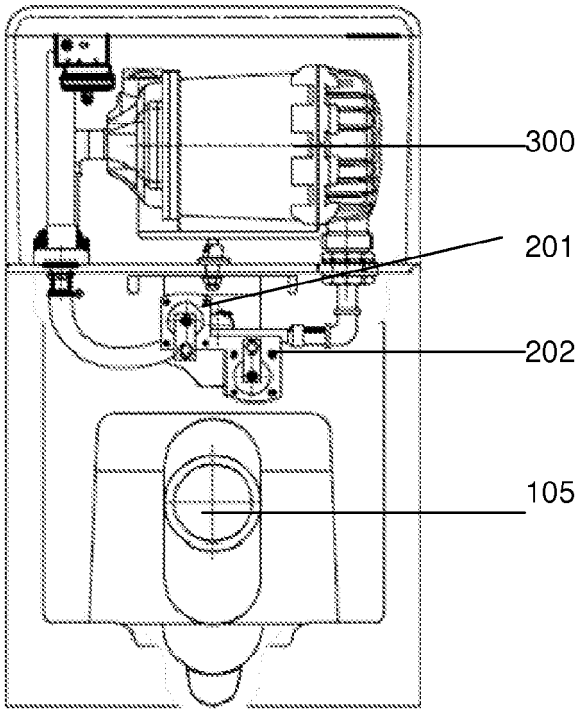

Figure 4

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- US 5926863 A **[0021]**
- US 2007277302 A **[0021]**
- US 4918764 A **[0021]**
- BR MU72007982 **[0021]**
- BR MU86011677 **[0022]**