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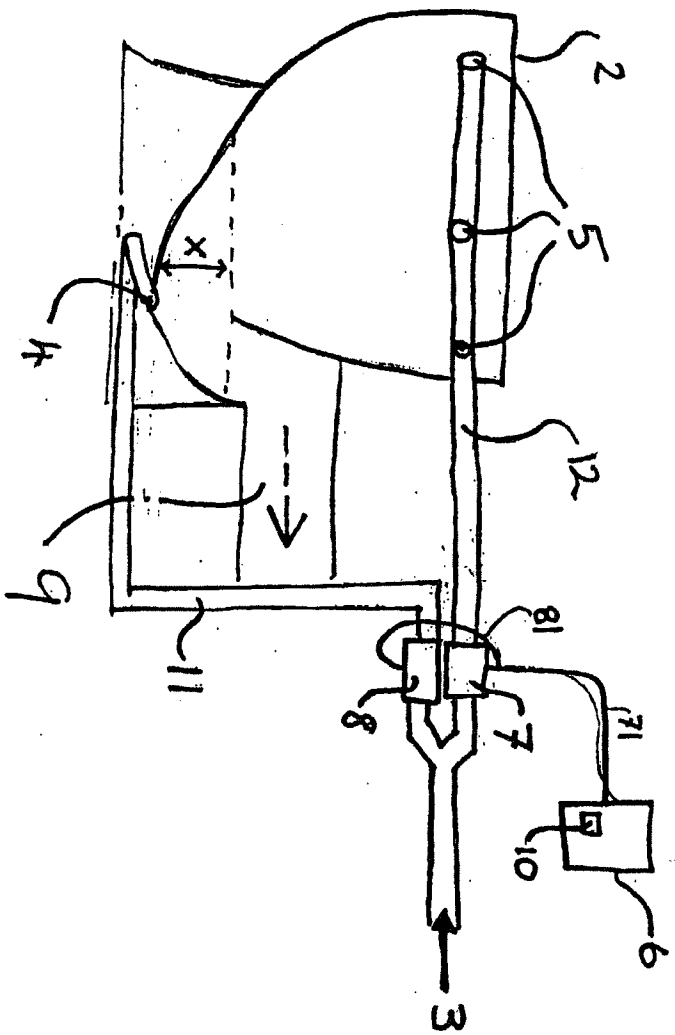


FIGURE 1

FIGURE 2

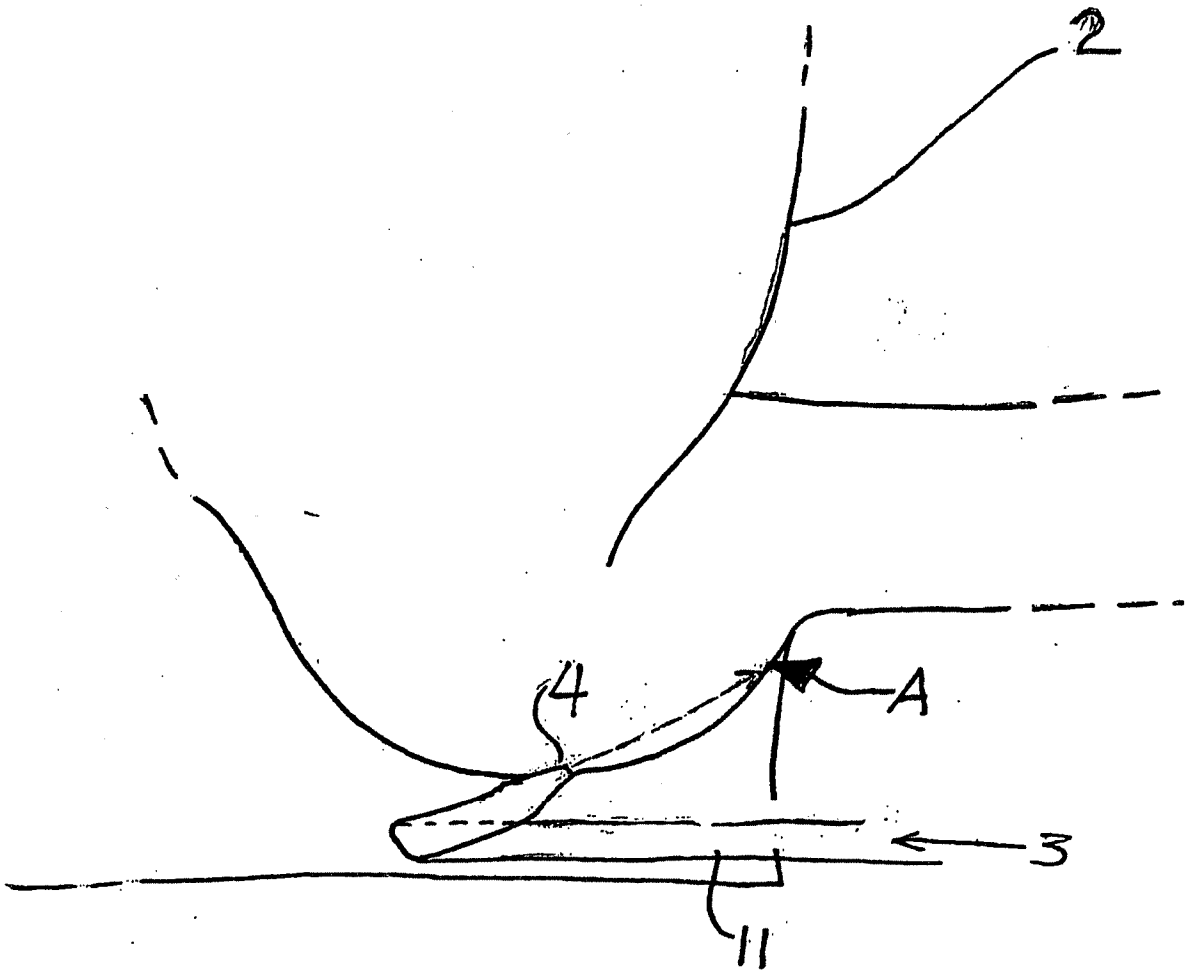


FIGURE 3

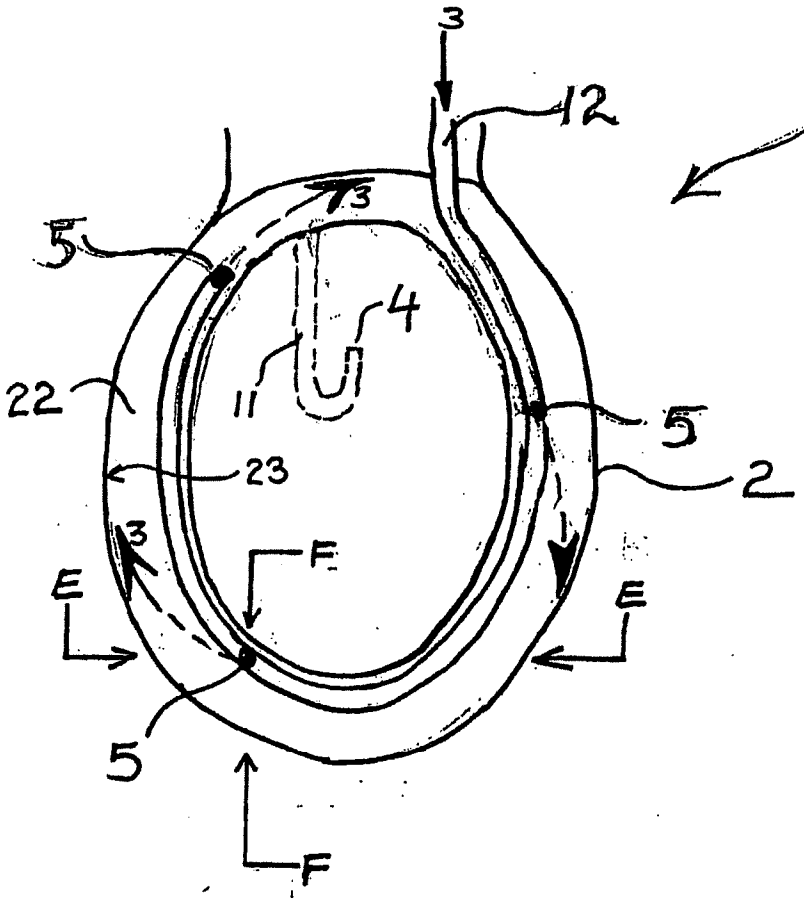


FIGURE 4

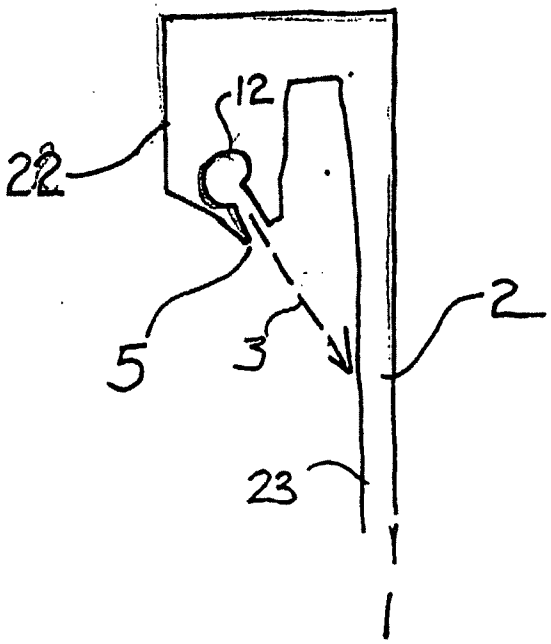
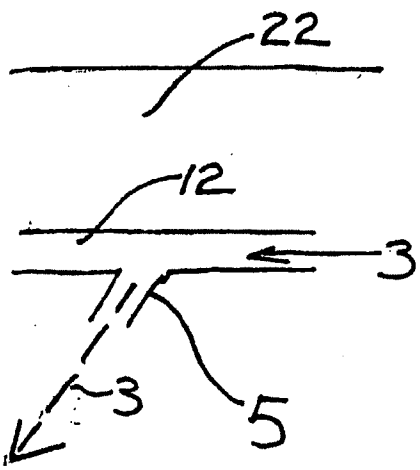


FIGURE 5



TOILET HAVING A PRESSURISED WATER SUPPLY

TECHNICAL FIELD

This invention relates to an improved toilet flushing system and includes methods for flushing and manufacture of the improved toilet.

BACKGROUND ART

The common gravity fed toilet system known today which utilises a toilet bowl connected to a cistern has the following disadvantages:

* It requires a reservoir or cistern to be full of water to enable it to flush, thus a toilet cannot be re-flushed immediately after a flush, until the cistern has been refilled.

* It requires a large volume of water for the toilet to flush properly and completely so that no waste residue is left in the bowl of the toilets.

* It can take a considerable amount of time for the flushing to be completed.

* The toilet when flushed generates a substantial amount of noise.

* The toilet cistern when filling often also creates a substantial amount of noise.

* The cistern requires several moving parts and washers so that it can operate, making it prone to mechanical failure and unnecessary water wastage due to leaking washers or other faulty parts. Furthermore, the ball cock valves often employed within a cistern can be notoriously unreliable in terms of their operation.

In the United States of America common gravity fed toilets, when flushed, fill the bowl nearly completely with water. Thus, during the initial flush when the bowl is emptied these toilets can be relatively quiet. However, a major drawback with these toilets is that

they utilize a large volume of water and still require a cistern in order to operate. They are therefore still noisy when the cistern refills.

Other toilets which require no cistern often utilize an extended vertical pipe within the wall cavity as a reservoir. However, such toilets are still noisy when flushed.

DISCLOSURE OF INVENTION

According to the first aspect of the present invention, there is provided a toilet, comprising:

a toilet bowl having a water outlet,

a first water supply conduit having at least one outlet in the vicinity of an upper region of the toilet bowl,

a second water supply conduit having an outlet in a lower region of the bowl, the outlet of the second water supply conduit oriented to direct water passing therethrough towards the water outlet and against a surface of the toilet bowl,

a water inlet conduit adapted for connection to a pressurised water supply and to channel water to said first and second water supply conduits,

a first flow regulator in said first water supply conduit and a second flow regulator in said second water supply conduit,

a control device configured to operate said first and second flow regulators to control the flow of pressurised water in said first and second water supply conduits to selectively deliver water from the pressurised water supply,

(a) via the second water supply to create a venturi effect to evacuate waste and water from the toilet bowl; and

(b) via the first water supply conduit to travel along the wall of the toilet bowl to thereby wash and refill the toilet.

Preferably, the diameter of the outlet of the second water supply conduit is less than the diameter of the second water supply conduit.

Preferably, the control device is operably connected to the flow regulators such that when the control device is activated to flush the toilet, the control device is configured to operate the flow regulator so that:

(a) water from the pressurised water supply enters the bowl via the first water supply for a predetermined period of time,

(b) water from the pressurised water supply enters the bowl via the second water supply conduit from the bottom outlet for a predetermined period of time;

(c) water from the pressurised water supply then re-enters the bowl via the first water supply conduit for a predetermined period of time; and then

(d) water to the bowl is shut off, until the control device is reactivated to flush the toilet.

Preferably, the water inlet conduit is adapted for connection to a mains water supply having a water pressure of at least 30 PSI.

Preferably, the at least one outlet in the vicinity of an upper region of the toilet bowl is/are positioned about the top of the bowl, such that water exiting the outlet or outlets travels around and down the walls of the bowl in a substantially clockwise or anti-clockwise direction.

Preferably, the top outlet or outlets are configured to allow for water to be directed onto the top of the wall of the toilet.

Preferably, the water exiting the outlet of the second water supply conduit does so through a tapered end portion which increases the velocity of the water and directs it towards the water outlet of the toilet bowl at a point on the wall of the toilet bowl

approximately 5 centimetres above the outlet of the second water supply conduit such that water and waste are sucked out of the bowl to leave the bowl empty.

Preferably, the flow regulators comprise on/off valves.

Preferably, the flow regulators comprise a solenoid valve having an inlet and two outlets wherein the valve is configured to be capable of:

(a) directing the water to either the first or second water supply conduits, and

(b) shutting off the water supply to both water supply conduits.

Alternatively, there are provided two flow regulators in the form of separate solenoid valves each having an inlet and an outlet.

Preferably, the control device is an electronic timing device.

According to a second aspect of the present invention, there is provided a method of flushing a toilet comprising the steps of:

(a) controlling the flow of a pressurised water supply to a toilet bowl,

(b) delivering the pressurised water supply to the toilet bowl so that the pressurised water:

i) creates a venturi effect to evacuate waste and water from the toilet bowl by being directed towards a water outlet of the toilet bowl and against a surface of the toilet bowl, and

ii) travels along the wall of the toilet bowl to thereby wash and refill the toilet.

Preferably, the method further comprises the steps of:

(a) providing water to at least two top outlets for a predetermined period of time, wherein the top outlets are positioned at the top of the toilet bowl to direct water onto the wall of the toilet bowl,

(b) providing water to at least one bottom outlet for a predetermined period of time wherein said bottom outlet or outlets is positioned in the base of the toilet bowl and configured to achieve a venturi effect capable of evacuating water and waste from the bowl,

(c) providing water to the at least two top outlets for a predetermined period of time, and

(d) stopping the flow of water to the top outlets to complete the flush cycle once the bowl has been filled to the desired level.

The toilet bowl may have a variety of configurations without departing from the scope of the present invention.

Generally, the toilet bowl may include a rim; a base. The toilet is usually also connected to a P or S trap and is connected to a mains sewer system, septic tank or other waste reservoir in the normal manner.

The term "pressured water supply" refers to a source of water which can be supplied at pressure.

In preferred embodiments the pressured water supply may be a mains water supply.

In general, the mains water supply may have a water pressure of at least substantially 30 - 70 PSI. Preferably, the water pressure of the mains water supply may be substantially 30 PSI.

However, other types of pressured water supply may be utilised without departing from the scope of the present invention, provided they supply water to the toilet at a water pressure substantially as outlined above.

The water outlets may have a variety of different configurations without departing from the scope of the present invention.

In general, the water outlets may be any suitable nozzle, opening or such like.

Preferably the tope outlets are configured to allow for water to be directed onto the tope of the wall(s) of the toilet.

The number of top outlets used in the present invention may vary without departing from the scope of the present invention.

Generally, at least two top outlets may be utilised in the present invention.

Preferably, three top outlets may be utilised in the present invention.

The term "venturi effect" as used herein refers to the reduction in pressure or vacuum created by an increase of fluid flow velocity.

The venturi effect may be created by:

a) water exiting the bottom outlet through a tapered end portion which increases the velocity of the water; and

b) the water exiting the bottom outlet such that it is directed towards the back of the bowl to a point approximately 5 cm above the outlet;

such that water and waste are sucked out of the bowl to leave the bowl empty.

However, this should not be seen in limiting the scope of the present invention as the venturi effect may also be achieved via other means.

The flow regulators may have a variety of configurations without departing from the scope of the present invention.

The flow regulator may be a solenoid valve having an inlet and two outlets wherein the valve is configured to be capable of:

a) directing water to either a first or second outlet from said valve; and

b) shutting off the water supply to both outlets.

Alternatively, there may be provided two flow regulators in the form of solenoid (on/off) valves each having an inlet and an outlet. In general the solenoid valve may be any suitable solenoid valves as would be readily apparent to a person skilled in the art. For example, the solenoid valves may substantially be the same as those used in domestic appliances such as dishwasher and the like.

The control device may have a variety of configurations without departing from the scope of the present invention.

Generally, the control device may consist of any device which is configured to be capable of operating at least one flow regulator in the desired manner, over a predetermined time period.

The control device may be an electronic timing device capable of being configured to operate at least one flow regulator in a desired manner over a predetermined time period.

The control device may be capable of being adjusted to allow for the flow regulators to be operated at different predetermined times depending on the pressure of the pressured water supply.

The control device may be or include a suitably programmable logic unit such as a CPU.

The control device may sense the pressure of the water supply and may adjust the predetermined times the flow regulator(s) remain open accordingly.

In one embodiment the predetermined time that the flow regulator is opened for the bottom outlet is substantially 8 seconds when the mains pressure is at substantially 30-60 PSI so as to allow for the bowl to be evacuated.

In another preferred embodiment the predetermined time that the flow regulator is opened for the top outlet is substantially 3 seconds when the mains pressure is at 30-60 PSI so as to allow for the bowl to be evacuated.

The inventor has found these parameters to be very economical in terms of water use such that only 3-4 litres of water is required per flush.

However, it will be clear to those skilled in the art that the flow regulators may remain open for different predetermined times dependent on the mains pressure from which the system is being operated, and/or the order in which the flow regulators are operated.

In general, water is supplied to the top and bottom outlets via separate conduits that are connected to the flow regulator(s).

Thus, preferred embodiments of the present invention provide an improved toilet and flushing system which may have the following advantages:

a) is substantially quiet in its flushing operation;

b) only requires a small volume of water to flush the toilet;

c) does not require a cistern to operate;

d) is capable of connecting directly to a mains water supply.

BRIEF DESCRIPTION OF DRAWINGS

Further aspects of the present invention will become apparent from the ensuing description which is given by way of example only and with reference to the accompanying drawings in which:

Figure 1 shows a schematic side view of one preferred embodiment of the present invention.

Figure 2 shows a schematic cross-sectional view of the base of the toilet system of Figure 1.

Figure 3 shows a schematic plan view of the toilet bowl of the toilet system of Figure1.

Figure 4 shows a transverse cross-sectional schematic view of the rim of the toilet along the plane of line E-E on Figure 3.

Figure 4 shows a longitudinal cross-sectional schematic view of the rim of the toilet bowl along the plane of line F-F on Figure 3.

BEST MODES FOR CARRYING OUT THE INVENTION

With respect to the drawings there is shown an improved toilet and flushing system generally indicated by arrow 1. The toilet and flushing system has a toilet bowl 2, water 3 supplied via conduit connected to a mains water supply (not shown) having a pressure of substantially between 30 and 70 PSI. The toilet bowl 2, has one bottom outlet 4, and three top outlets 5 and a waste channel 9. The flow of water 3 from the mains water supply is regulated by solenoid valves 7 and 8, such are commonly used in conventional dishwashers which have an inlet and outlets. The solenoid valves 7 and 8 are connected via wires 71 and 81 to a control device in the form of an electronic timer 6, such as a two cycle output timer.

In operation when the electronic timing device 6 is activated by depressing a switch 10 the electronic timing device 6 opens the solenoid valve 7 so that water 3 can be supplied via conduit 11 to the bottom outlet 4. The valve 7 remains open for a set period of time,

preferably substantially 8 seconds so that the water and waste residing in the base of the bowl can be evacuated, via the venturi effect, into the waste channel 9. The electronic timing device 6 then closes the solenoid valve 7 and opens solenoid valve 8 for a set period of time, preferably substantially 3 seconds, to provide water to the top outlets 5 via conduit 12. The three top outlets 5 direct water onto the walls of the bowl 2 thereby rinsing the sides of the bowl 2. The solenoid valve 8 remains open until sufficient water has filled the base of the bowl to the desired level indicated by double headed arrow X. In general, the level indicated by arrow X is approximately 10 cm above the base of the bowl 2. The electronic timing device 6 then closes solenoid valve 8 to complete the flushing cycle.

Figure 2 shows a detailed cross-sectional view of the base of the toilet bowl 2. The bottom outlet 4 is positioned within the base of the toilet bowl 2. The bottom outlet has been configured so water 3 exiting the outlet is directed onto the back of bowl 2 at point A, which is approximately 5 cm above the position of the bottom outlet 4. As can also be seen the bottom outlet 4 has an opening with a diameter that is reduced with respect to the diameter of conduit 11 so as to help create a venturi. Then inventor has also found that the venturi effect is further enhanced when the outlet 4 is directed at point A, on the back wall of the bowl towards the P (or S) trap. The effect of the venturi is to evacuate water and waste as described above to empty the bowl 2.

Figure 3 is a plan view of the toilet bowl 2. The conduit 12 is positioned around the top of the bowl so that it can provide water to the three top outlets 5 which are positioned at regular intervals around the bowl 2. When water 3 exits the top outlets 5 and is directed at an angle down onto the wall 23 of the bowl 2 and also around the bowl in the direction of dotted arrows 3 so as to create a circular (swirling) flow of water around wall 23.

Figures 4 and 5 respectively show a transverse (refer line E-E) and longitudinal (refer line F-F) cross-sectional views of the rim of the toilet bowl shown in Figure 3. As can be seen the conduit 12 is integrally formed as part of the rim 22 of the bowl 2. However,

it should be appreciated that the conduit 12 may in some embodiments be fitted to the rim and attached via clips, adhesive or other suitable fastening means. The outlets 5 are angled so as to:

a) direct water 3 as indicated by the dotted arrow onto the wall(s) of the bowl 2 (refer figure 4); and

b) direct water as indicated by arrow B so that it exits the outlet 5 in a substantially clockwise direction as indicated by dotted arrow 3 (refer figures 3 and 5).

WHAT WE CLAIM IS:

1. A toilet comprising

a toilet bowl having a water outlet,

a first water supply conduit having at least one outlet in the vicinity of an upper region of the toilet bowl,

a second water supply conduit having an outlet in a lower region of the bowl, the outlet of the second water supply conduit oriented to direct water passing therethrough towards the water outlet and against a surface of the toilet bowl,

a water inlet conduit adapted for connection to a pressurised water supply and to channel water to said first and second water supply conduits,

a first flow regulator in said first water supply conduit and a second flow regulator in said second water supply conduit,

a control device configured to operate said first and second flow regulators to control the flow of pressurised water in said first and second water supply conduits to selectively deliver water from the pressurised water supply,

a) via the second water supply conduit to create a venturi effect to evacuate waste and water from the toilet bowl; and

b) via the first water supply conduit to travel along the wall of the toilet bowl to thereby wash and refill the toilet.

2. A toilet as claimed in claim 1, wherein the diameter of the outlet of the second water supply conduit is less than the diameter of the second water supply conduit.

3. A toilet as claimed in claim 1 or claim 2, wherein the control device is operably connected to the flow regulators, such that when the control device is activated to flush the toilet, the control device is configured to operate the flow regulator so that:

a) water from the pressurised water supply enters the bowl via the first water supply for a predetermined period of time,

b) water from the pressurised water supply enters the bowl via the second water supply conduit from the bottom outlet for a predetermined period of time;

c) water from the pressurised water supply then re-enters the bowl via the first water supply conduit for a predetermined period of time; and then

d) water supply to the bowl is shut off, until the control device is reactivated to flush the toilet.

4. A toilet as claimed in any one of the preceding claims, wherein the water inlet conduit is adapted for connection to a mains water supply having a water pressure of at least 30 PSI.

5. A toilet as claimed in any one of the preceding claims, wherein the at least one outlet in the vicinity of an upper region of the toilet bowl is/are positioned about the top of the bowl, such that water exiting the outlet or outlets travels around and down the walls of the bowl in a substantially clockwise or anti-clockwise direction.

6. A toilet, as claimed in claim 5, wherein the top outlet or outlets are configured to allow for water to be directed onto the top of the wall of the toilet.

7. A toilet as claimed in any one of the preceding claims, wherein water exiting the outlet of the second water supply conduit does so through a tapered end portion which increases the velocity of the water and directed it towards the water outlet

of the toilet bowl at a point on the wall of the toilet bowl approximately 5 centimetres above the outlet of the second water supply conduit such that water and waste are sucked out of the bowl to leave the bowl empty.

8. A toilet as claimed in any one of the preceding claims, wherein the flow regulators comprise on/off valves.

9. A toilet as claimed in any one of the preceding claims, wherein the flow regulators comprise a solenoid valve having an inlet and two outlets wherein the valve is configured to be capable of:

a) directing water to either the first or second water supply conduits, and

b) shutting off the water supply to both water supply conduits.

10. A toilet as claimed in any one of claims 1 to 8, wherein there are provided two flow regulators in the form of separate solenoid valves each having an inlet and an outlet.

11. A toilet as claimed in any one of the preceding claims, wherein the control device is an electronic timing device.

12 A method of flushing a toilet comprising the steps of:

a) controlling the flow of a pressurised water supply to a toilet bowl,

b) delivering the pressurised water supply to the toilet bowl so that the pressurised water:

i) creates a venturi effect to evacuate waste and water from the toilet bowl by being directed towards a water outlet of the toilet bowl and against a surface of the toilet bowl, and

ii) travels along the wall of the toilet bowl to thereby wash and refill the toilet.

13. A method for flushing a toilet as claimed in claim 12, further comprising the steps of:

i) providing water to at least two top outlets for a predetermined period of time, wherein the top outlets are positioned at the top of the toilet bowl to direct water onto the wall of the toilet bowl,

ii) providing water to at least one bottom outlet for a predetermined period of time wherein said bottom outlet or outlets is positioned in the base of the toilet bowl and configured to achieve a venturi effect capable of evacuating water and waste from the bowl,

iii) providing water to the at least two top outlets for a predetermined period of time, and

iv) stopping the flow of water to the top outlets to complete the flush cycle once the bowl has been filled to the desired level.