US 20100050331A1

(19) **United States**

(12) **Patent Application Publication**

(10) **Pub. No.: US 2010/0050331 A1**

(43) **Pub. Date: Mar. 4, 2010**

Sim

(54) **SYSTEM AND METHOD FOR FLUSHING A TOILET**

(76) Inventor: **Jae Auk Sim**, Deerfield, IL (US)

Correspondence Address:
BISHOP & DIEHL, LTD.
1320 TOWER ROAD
SCHAUMBURG, IL 60173 (US)

(21) Appl. No.: **12/231,009**

(22) Filed: **Aug. 28, 2008**

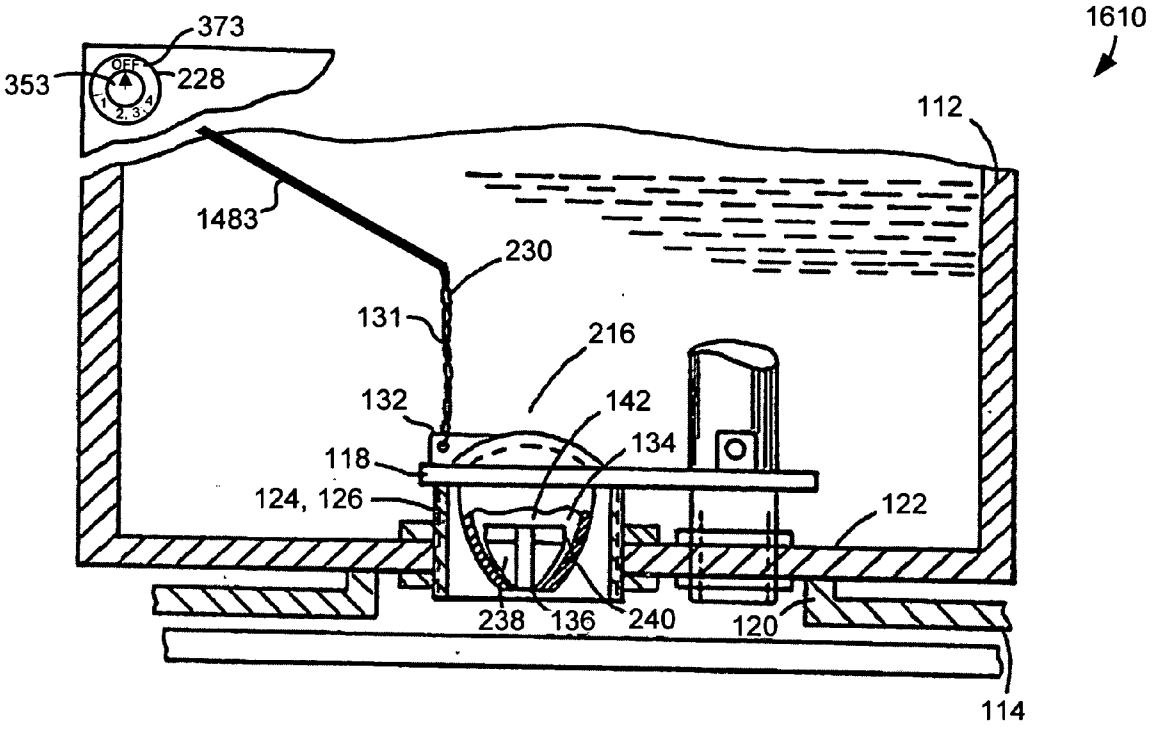
Publication Classification

(51) **Int. Cl.**
E03D 3/12 (2006.01)

(52) **U.S. Cl.** **4/324**

(57) **ABSTRACT**

A system and method is provided for flushing a toilet wherein the duration of the flush, and thus the amount of water used, is selectable by a user. In an embodiment, the system includes a controller and a non-buoyant flush valve that are coupled together via a linkage. The controller opens the flush valve for a time period set by a user. Once the time period has lapsed, the flush valve is closed.



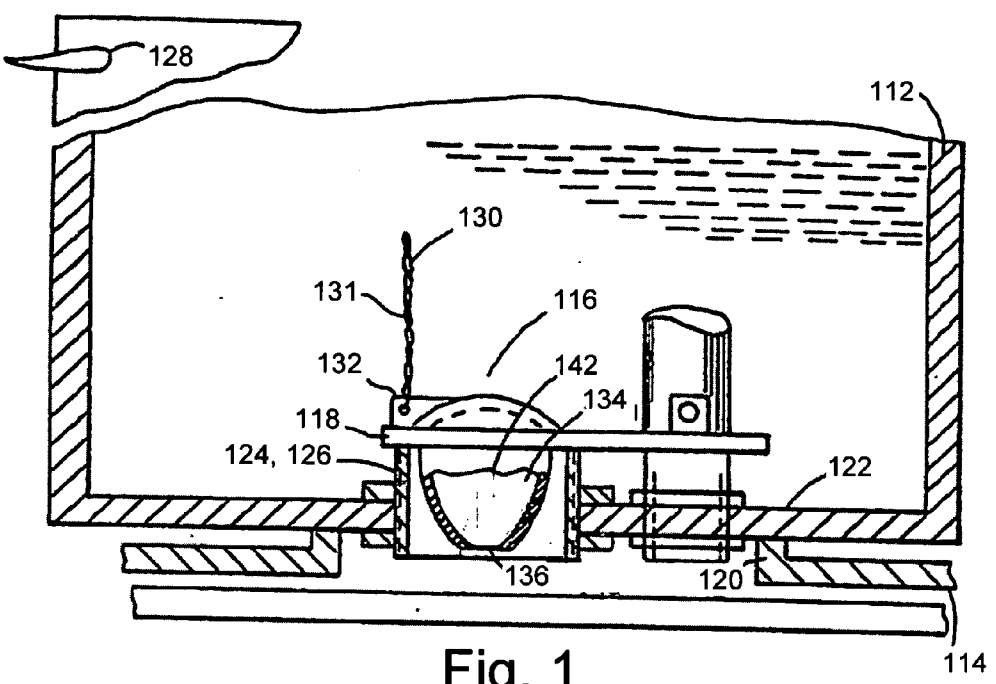


Fig. 1
(Prior Art)

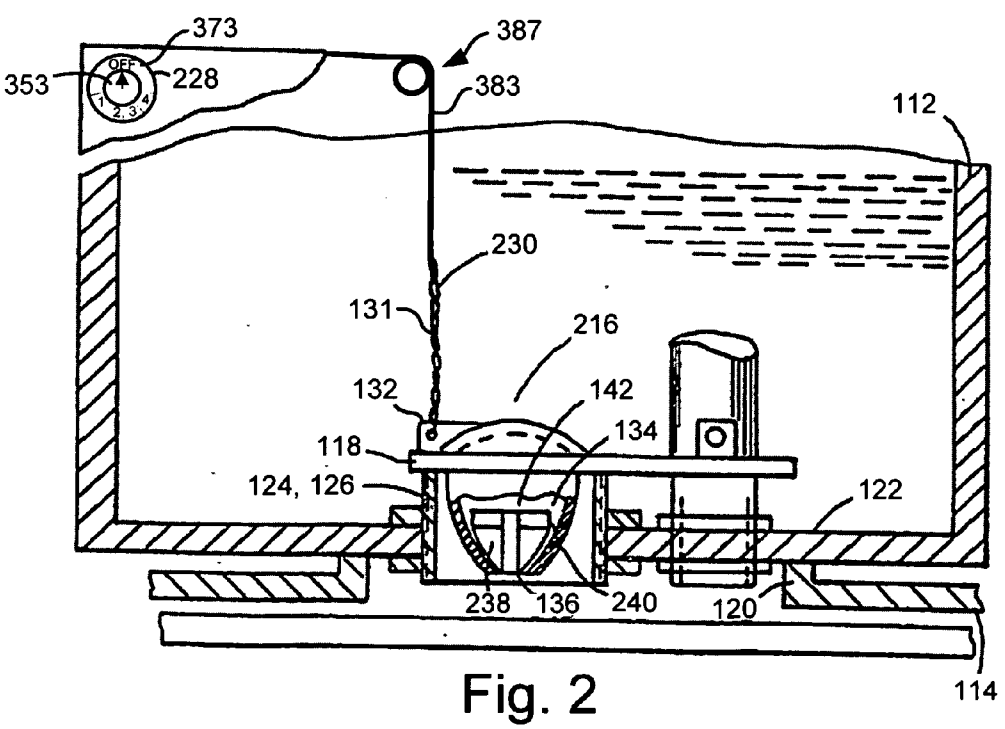


Fig. 2

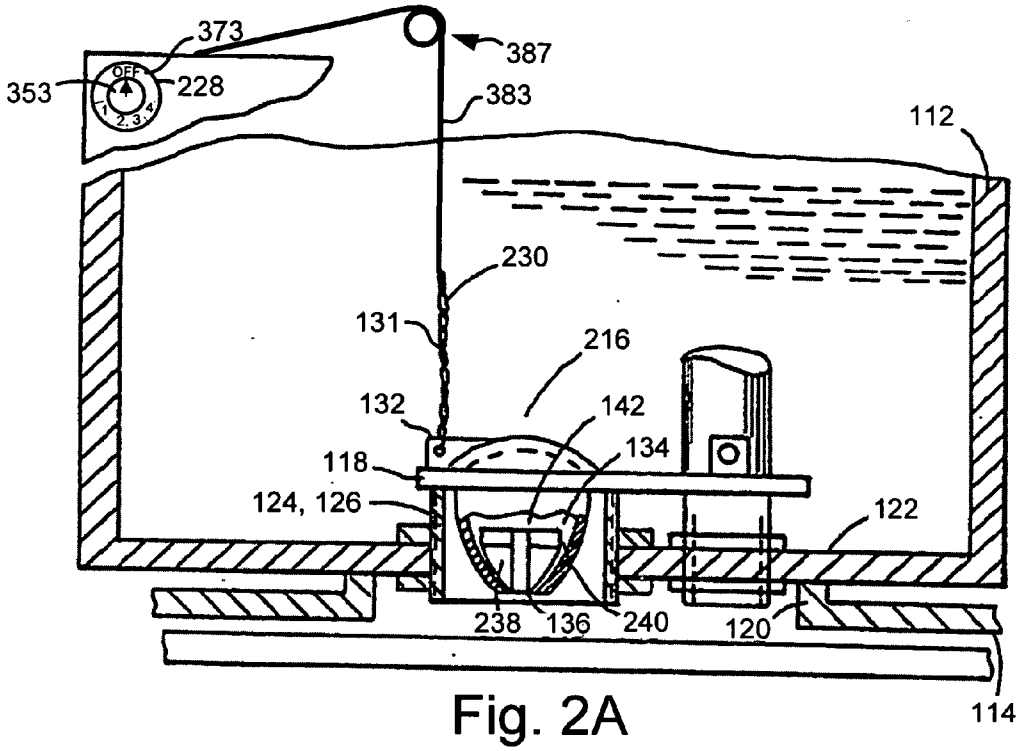

210
373
387
353
OFF
228
1 2 3 4
383
112
230
131
216
132
142
134
118
124, 126
122
238
136
240
120
114

Fig. 2A

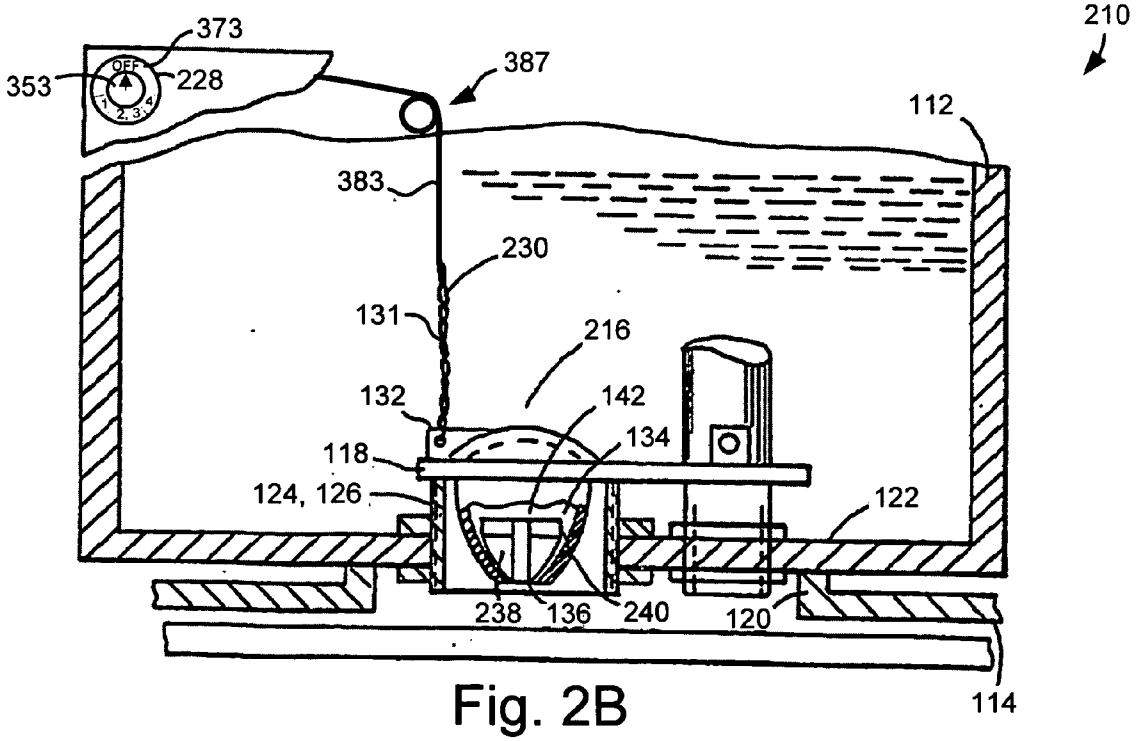

210
373
387
353
OFF
228
1 2 3 4
112
383
230
131
216
132
142
134
118
124, 126
122
238
136
240
120
114

Fig. 2B

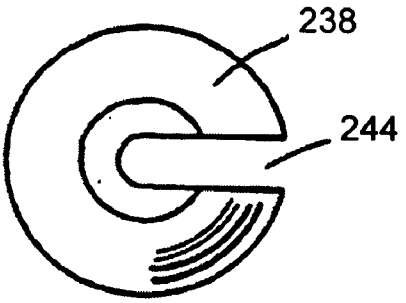


Fig. 3

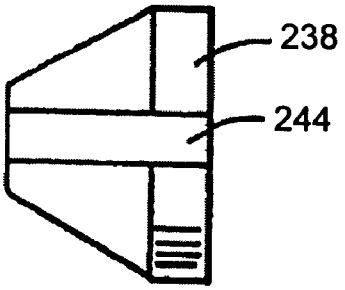


Fig. 4

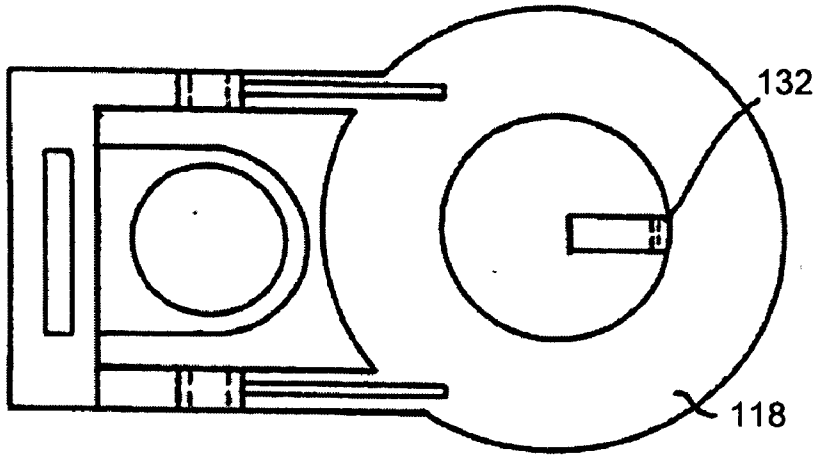


Fig. 5

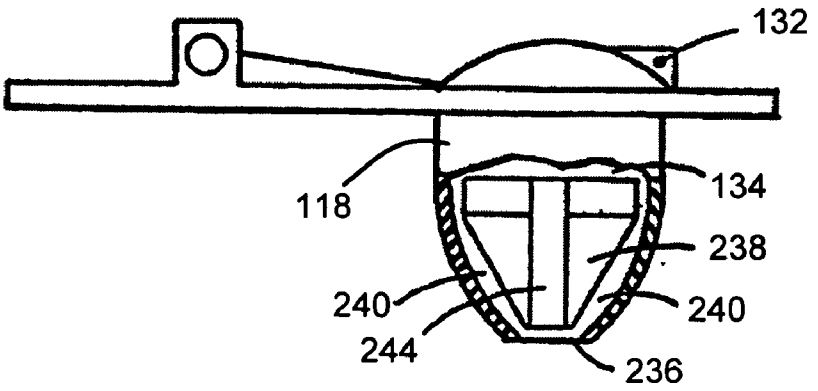


Fig. 6

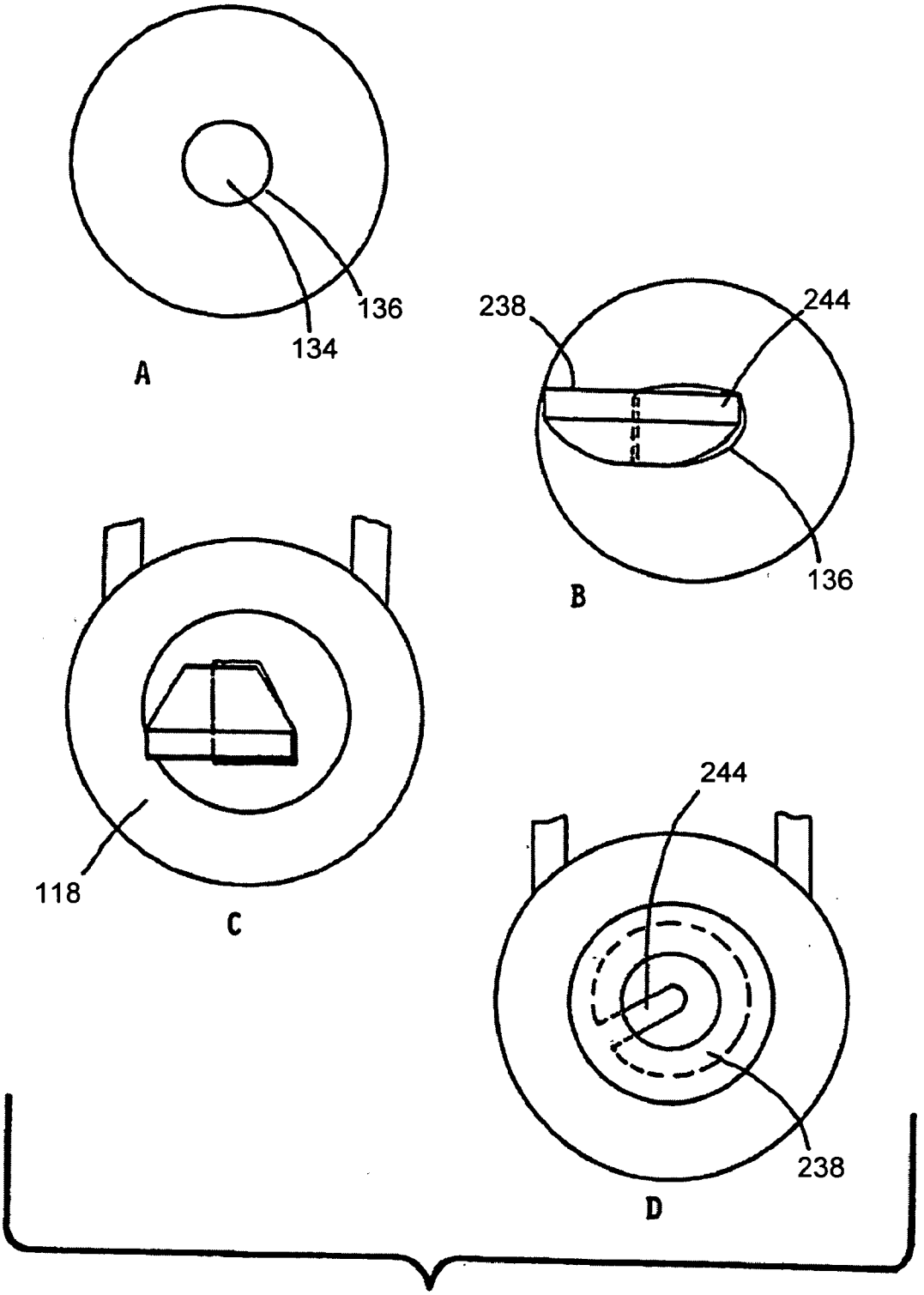
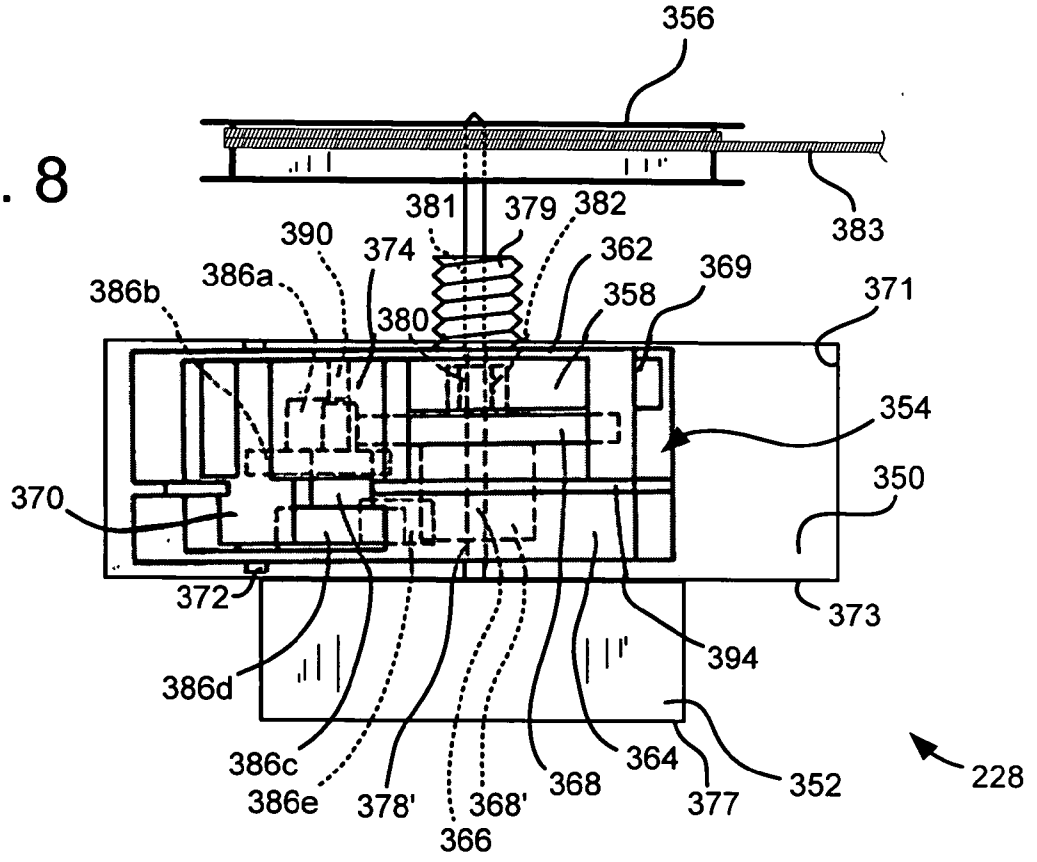


Fig. 7

Fig. 8


356
383
381
379
382
390
374
362
369
386a
386b
358
371
380
354
350
370
372
373
394
386d
386c
386e
378'
366
368'
368
364
377
352
228

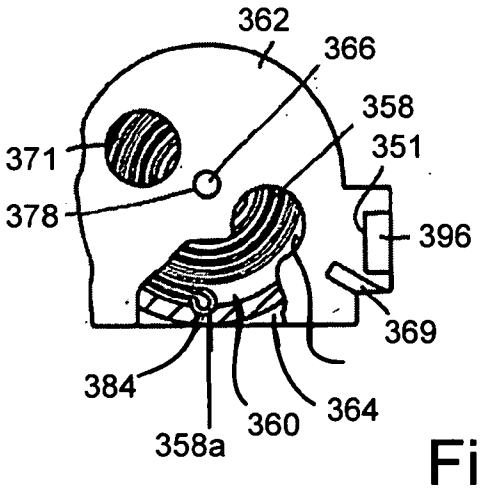
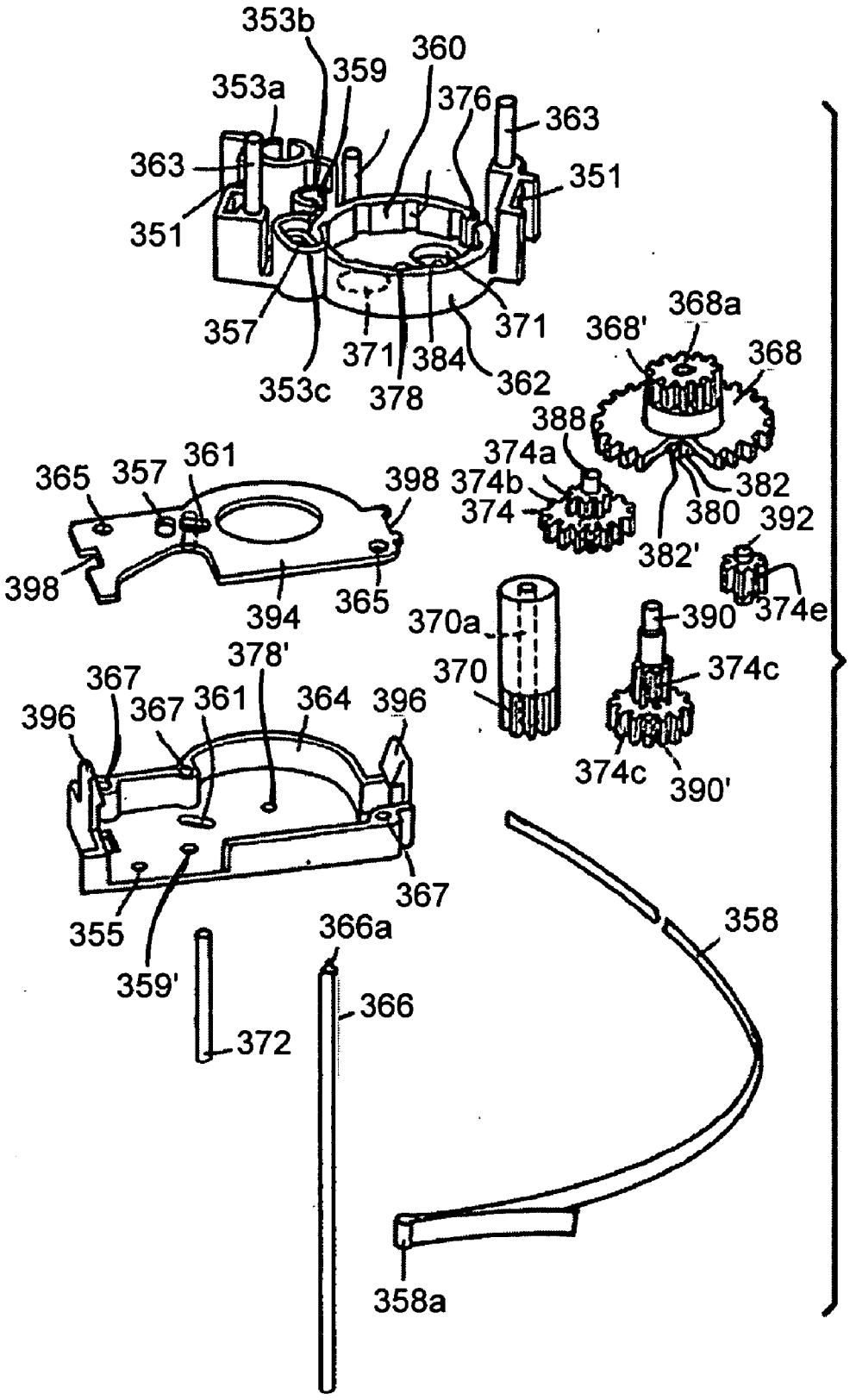

362
366
358
371
351
378
396
369
384
358a
360
364

Fig. 9

Fig. 10


353b
359
360
353a
376
363
363
351
351
357
371
371
384
353c
378
362
368a
368'
368
388
374a
374b
374
382
380
392
382'
374e
365
357
361
398
398
394
365
370a
390
370
374c
378'
367
367
361
364
396
396
374c
390'
367
355
359'
366a
366
372
358
358a

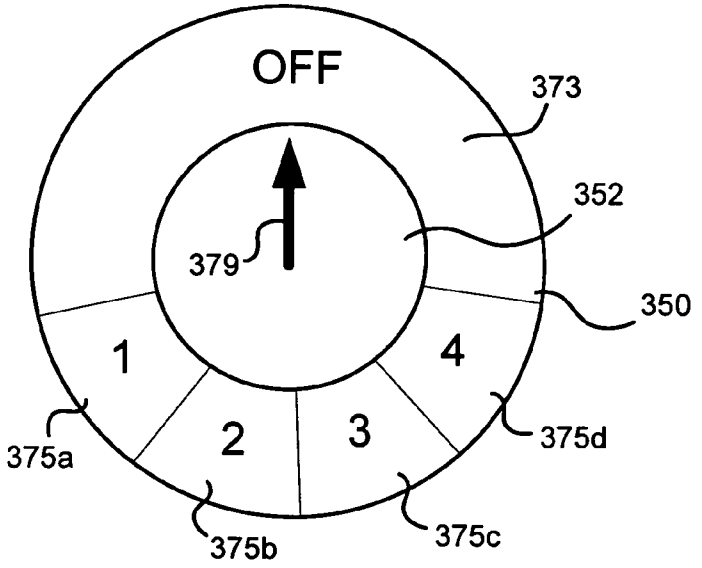
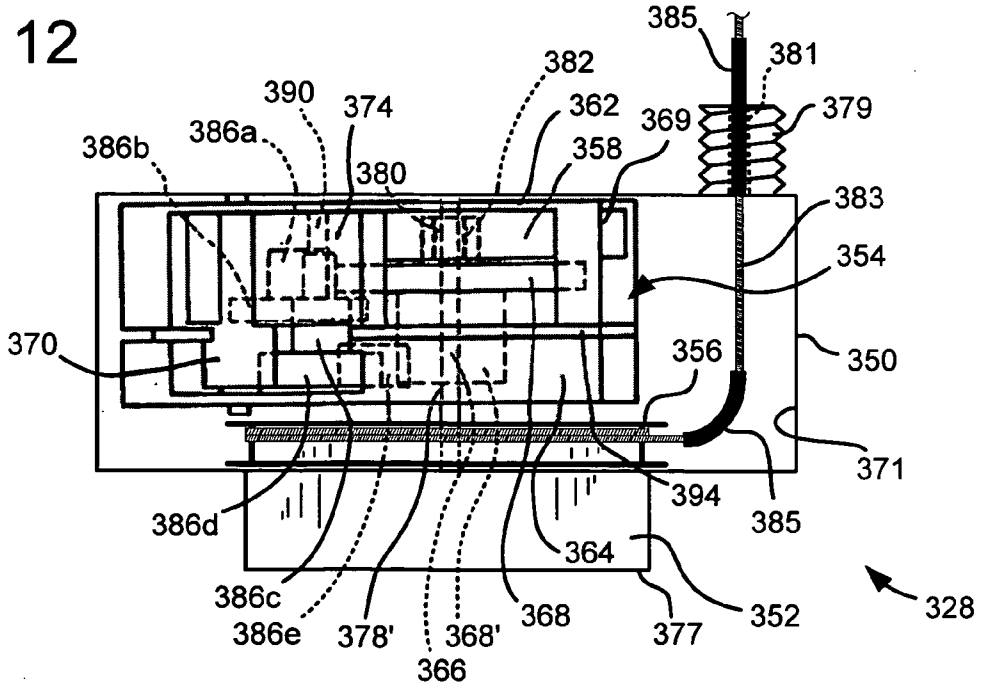

OFF
373
352
379
350
1
4
2
3
375a
375d
375b
375c

Fig. 11

Fig. 12


385
381
382
390
374
362
369
379
386b
386a
358
380
383
354
370
356
350
371
394
385
386d
364
386c
386e
378'
368'
366
368
377
352
328

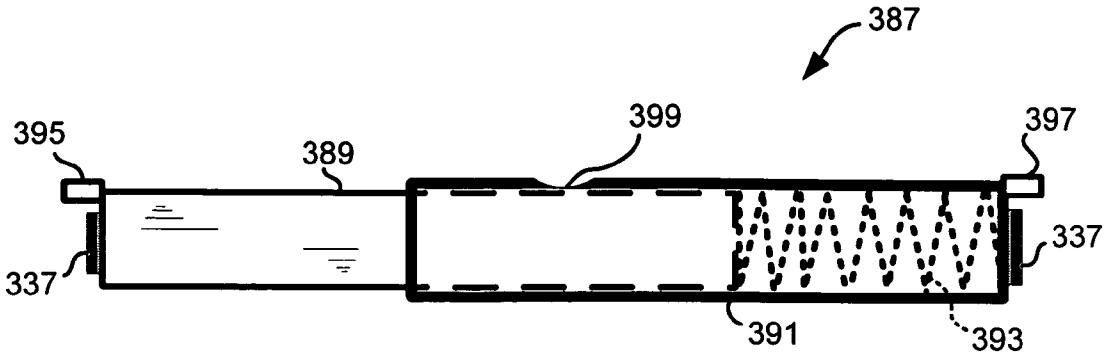


Fig. 13

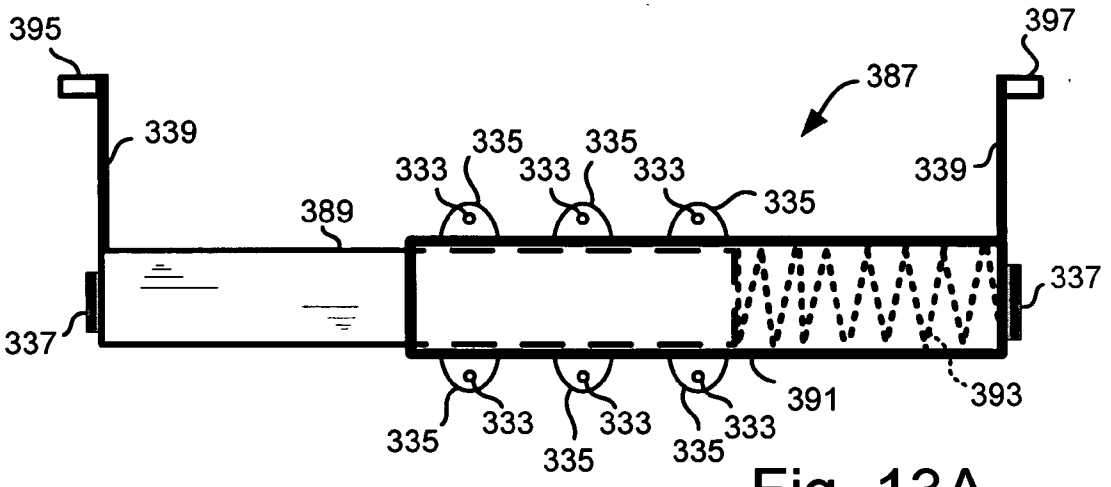


Fig. 13A

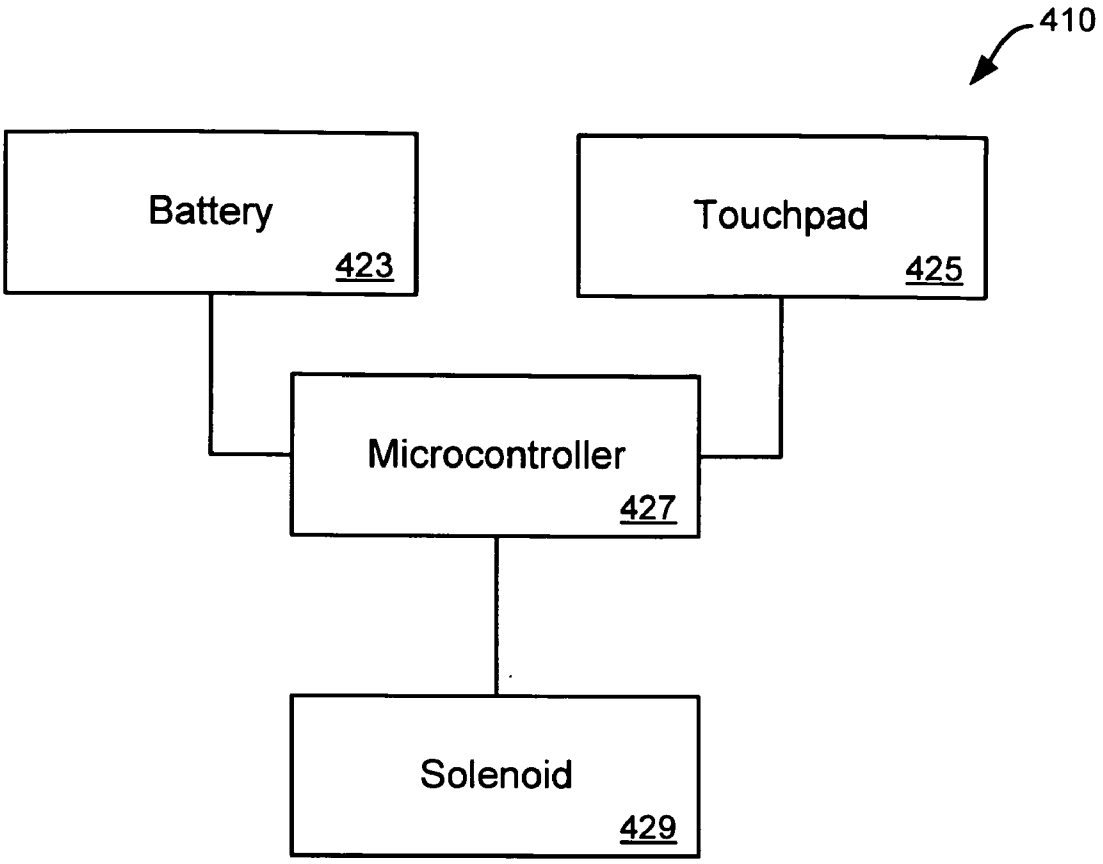

410
Battery
423
Touchpad
425
Microcontroller
427
Solenoid
429

Fig. 14

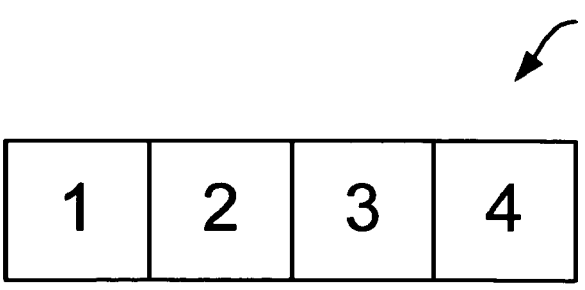

425
1
2
3
4

Fig. 15

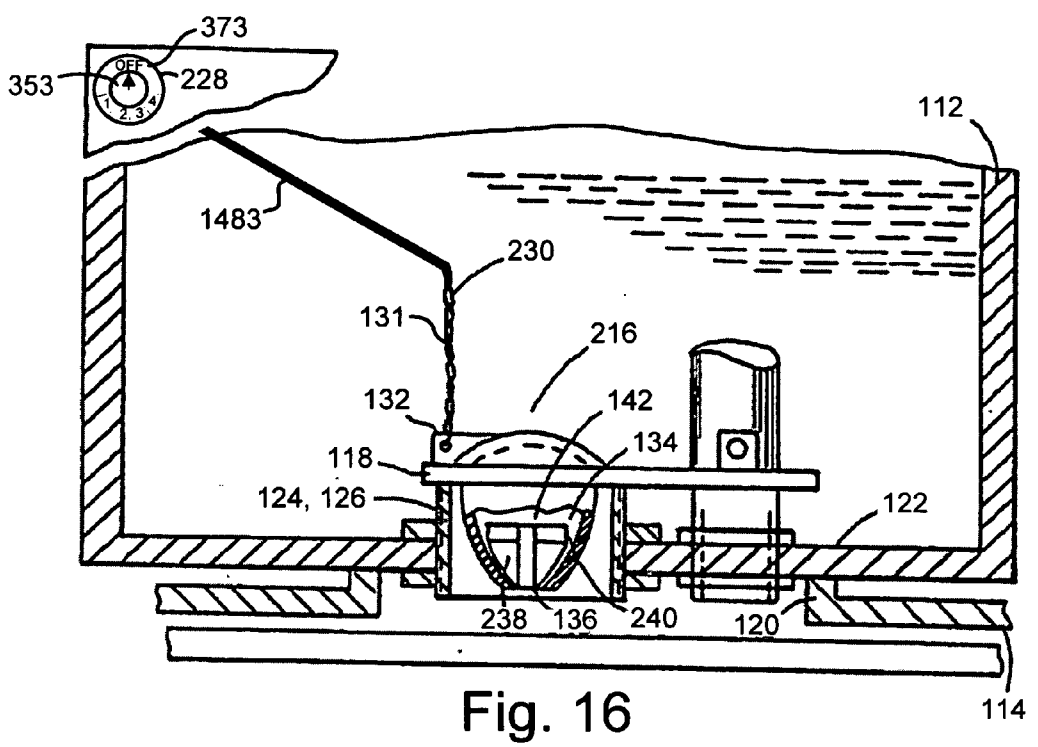

1610
373
353
OFF
1, 2, 3, 4
228
112
1483
230
131
216
132
142
134
118
124, 126
122
238
136
240
120
114

Fig. 16

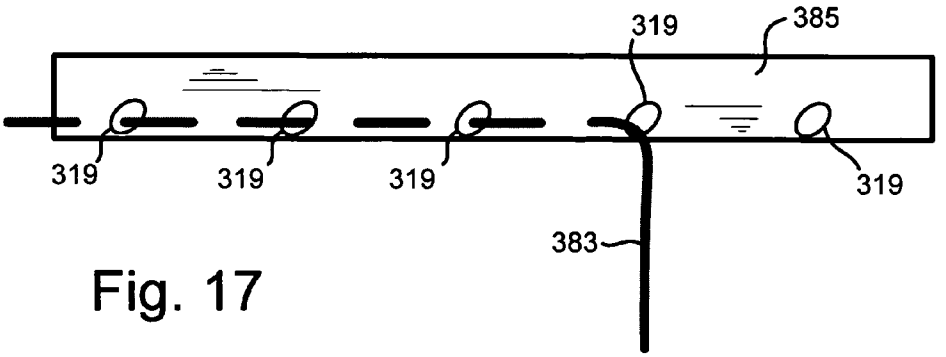

319
385
319
319
319
319
383

Fig. 17

SYSTEM AND METHOD FOR FLUSHING A TOILET

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] None.

TECHNICAL FIELD

[0002] The present invention pertains to toilet flushing systems and methods, and more particularly to a system and method that allows the user to select the quantity of water used for flushing the toilet.

BACKGROUND OF THE INVENTION

[0003] Turning to FIG. **1**, and as stated in U.S. Pat. No. 5,129,110 to Richter, incorporated herein by reference, most toilets used today consist of two main parts; an upper part which holds water, referred to as a tank section **112**, and a lower part consisting primarily of a bowl **114** with a volume of water which is designed to receive human waste products. Once the waste products have been deposited in the bowl, they are removed by releasing the water held in the upper tank section into the bowl. The released water removes the waste products to a collection system, such as a sewer system or a septic tank, and then refills the bowl so that there remains standing a volume of water. Waste products consist of solid and liquid wastes and in presently available toilets, one full flush is utilized to carry away both solid and liquid wastes, even when there is only liquid waste in the toilet bowl. In these standard toilets, a full complete flush is effected with each flush and the total contents of the water in the tank section is drained into the bowl and then out into the sewer system.

[0004] It is a well known fact that the largest use of water in most households and in many office buildings is for flushing toilets. Because flushing is carried out with the full capacity of the water in the water tank, the water usage is wasteful and is not required. In particular, conventional toilet tanks are designed to hold from three to eight gallons of water. In a family of four, it has been estimated that 20,000 gallons of fresh water could be saved yearly if the average flush were limited to between 2 and 2.5 gallons per flush.

SUMMARY OF THE INVENTION

[0005] A system and method is provided for flushing a toilet wherein the duration of the flush, and thus the amount of water used, is selectable by a user. Desirably, but not necessarily, the system and method is easy to install, universally adaptable to preexisting toilets, and uses a dial to allow a user to select the duration and thus the amount of water used in flushing a toliet.

[0006] In an embodiment, the system includes a controller and a non-buoyant flush valve that are coupled together via a linkage. The controller opens the flush valve for a time period set by a user wherein, once the time period has lapsed, the flush valve is automatically closed.

[0007] In yet another embodiment, a system is provided comprising a toilet bowl and a toilet tank attached to the toilet bowl so that when a toilet flush occurs, water from the tank drains into the toilet bowel. The tank includes a bottom surface having a tank drain comprising a valve seat and a flush valve removably mounted on the valve seat. The flush valve is made of a resilient material and has a hollow interior with an opening therethrough and an attachment point on its upper end. Loosely inserted into the interior of the flush valve is a weight that modifies the flush valve so its combined weight exceeds the specific gravity of water to make the valve non-buoyant. The weight is sized to allow a clearance between the circumferential perimeter of the weight and the inner surface of the flush valve so that the flush valve remains resilient near its lower perimeter to allow the valve to conform to and seal against the contour of the valve seat when the valve is in its seated or closed position. Also attached to the toilet tank is a controller for selecting a period of time to open the flush valve. Coupled to the controller and the flush valve is a linkage that is automatically released by the controller to close the flush valve once the period of time has lapsed.

[0008] In a further embodiment a system is provided comprising a toilet water tank attached to a toilet bowl so that when a toilet flush occurs, the water from the tank drains into the toilet bowl. The tank includes a bottom surface having a tank drain that includes a valve seat and a modified flush valve removably mounted on the valve seat. The flush valve is made of a resilient material and has a hollow interior with an opening therethrough and an attachment point on its upper end. Loosely inserted into the interior of the flush valve is a weight to modify the flush valve so the combined weight exceeds the specific gravity of water to make the valve non-buoyant. Also attached to the toilet tank is a controller for selecting a period of time to open the flush valve. Coupled to the controller and the flush valve is a linkage that is automatically released to close the flush valve once the period of time has lapsed.

[0009] In another embodiment, a method is provided for modifying a toilet flushing system to allow the quantity of water available in a toilet water tank for flushing a toilet to be selected by a user. The method includes removing the preexisting flush valve from the toilet water tank and obtaining a weight sized to loosely fit inside the flush valve. The weight is inserted through the opening in the flush valve and the flush valve is reinstalled in the toilet tank. Further, a controller is attached the toilet tank and coupled, via a linkage to the flush valve. Whereupon a period of time to open the flush valve can be selected and the linkage is automatically released by the controller to close the flush valve once the period of time has lapsed.

[0010] Other embodiments, systems, methods, features, and advantages of the present invention will be, or will become, apparent to one having ordinary skill in the art upon examination of the following drawings and detailed description. It is intended that all such additional systems, methods, features, and advantages be within the scope of the present invention, and can be protected by the accompanying claims.

BRIEF DESCRIPTION OF THE DRAWINGS

[0011] The invention may be better understood with reference to the following drawings. The components in the drawings are not necessarily to scale, emphasis instead being placed upon illustrating the principles of the invention. In the drawings, like reference numbers designate corresponding parts throughout.

[0012] FIG. **1** (Prior Art) is an elevation view in partial section of a conventional toilet flushing system;

[0013] FIG. **2** is an elevation view in partial section of a toilet flushing system in accordance with the present invention;

[0014] FIG. **2**A is an elevation view in partial section of another embodiment of a toilet flushing system in accordance

with the present invention, similar to FIG. **2**, wherein the linkage guide assembly is positioned to direct the linkage at an acute angle between the flush controller and the flush valve;

[0015] FIG. **2**B is an elevation view in partial section of another embodiment of a toilet flushing system in accordance with the present invention, similar to FIG. **2**, wherein the linkage guide assembly is position to direct the linkage at an obtuse angle between the flush controller and the flush valve;

[0016] FIG. **3** is a plan view of a weight as used with the flush valve in the system of FIG. **2**;

[0017] FIG. **4** is an elevation view of the weight shown in FIG. **3**;

[0018] FIG. **5** is a top plan view of a modified flush valve;

[0019] FIG. **6** is an elevation view in partial section showing the placement of the weight in the modified flush valve;

[0020] FIG. **7** is a sequential plan view illustration how the weight is installed through the opening of the flush valve;

[0021] FIG. **8** is a top partial diagrammatic plan view of a flush controller in accordance with the present invention;

[0022] FIG. **9** is a side elevation view, with part broken away, depicting a spring installed within the flush controller of FIG. **8**;

[0023] FIG. **10** is an exploded perspective view of a portion of the flush controller of FIG. **8**;

[0024] FIG. **11** is a front elevation view of the user control to the flush controller of FIG. **8**;

[0025] FIG. **12** is a top partial diagrammatic plan view of an alternative embodiment of a flush controller in accordance with the present invention;;

[0026] FIG. **13** is a support member for the linkage between the flush controller of FIG. **8** or **12** and the flush valve of FIG. **5**;

[0027] FIG. **13**A is an alternative embodiment of a support member for the linkage between the flush controller and the flush valve of FIG. **2**B;

[0028] FIG. **14** is a simplified functional block diagram of an electronic flush controller in accordance with the present invention;

[0029] FIG. **15** is an elevation view of an embodiment of a touchpad user control in accordance with the present invention;

[0030] FIG. **16** is an elevation view in partial section of another embodiment of a toilet flushing system in accordance with the present invention, similar to FIG. **2**, wherein the linkage between the flush valve and the flush controller is a chain and a rod coupled together; and,

[0031] FIG. **17** is a side elevation view of a tubular guide for the linkage between the flush controller and the flush valve.

DETAILED DESCRIPTION

[0032] The following descriptions of detailed embodiments are for exemplifying the principles and advantages of the inventions claimed herein. They are not to be taken in any way as limitations on the scope of the inventions.

[0033] In an embodiment in accordance with the present invention, a selectable toilet water level flushing system is provided to allow a toilet user to select the quantity of water used for a toilet flush. The selected quantity of water is dependent upon the type of waste to be disposed; for liquid waste, a partial flush is recommended while for solid waste, a full flush would be used. The quantity of water available for the toilet flush is controlled by the user selecting a time duration for a toilet flush.

[0034] Accordingly, turning to FIG. **2**, a system **210** is depicted in accordance with the present invention. The system includes a modified flush valve **216** that can consist of a modified flapper valve **118**. The flush valve **216** operates in combination with a conventional toilet assembly that includes a toilet tank **112** and a toilet bowl **114** having a bowl drain **120** on its upper surface. The tank **112** includes on its bottom surface **122** a tank drain **124** that has an upwardly extending valve seat **126**. Attached to the tank **112** is a flush controller **228** that is connected via a mechanical linkage **230** to an attachment point **132** on the top of the flush valve **216**. The flush controller **228** allows manual control of the flush valve position and the duration (i.e., amount of time) that the flush valve is in an open position before being automatically closed. The tank **112** is attached to the bowl **114** by interfacing the bowl drain **120** with the tank drain **124**. Thus, when a toilet flush occurs, the water in the tank flows into the toilet bowel **114**, from where the water is routed into a sewer system or septic tank.

[0035] An aspect of the invention is the replacement of a normally buoyant flush valve **116** with a flush valve **216** that is not buoyant. In an embodiment, the nonbuoyant flush valve can be manufactured with a preinstalled weight contained or enclosed within the rubber or compliant flush valve. Alternatively, in another embodiment, the system **210** operates with the modified flapper valve **118** as shown in FIGS. **1**, **5**, **6** and **7**.

[0036] The modified flush valve **216** is made of a resilient material, such as rubber and has a hollow interior **134**. On the upper surface of the valve is located an attachment point **132** that attaches to the flush controller **228** via the mechanical linkage **230** and on its bottom surface as shown in FIG. **6**, is located an opening **136**. To modify the flapper valve **118**, a weight **238** as shown in FIGS. **3** and **4** is inserted through the opening **136** and into the hollow interior **134** of the valve as shown in FIGS. **6** and **7**. As shown in the FIGS., the weight **238** is smaller than the inside of the valve and fits loosely within the valve interior. Thus, allowing a space **240** to be created between the circumferential perimeter of the weight and the inner surface of the valve. This space **240** allows the valve to remain resilient near its lower perimeter so that the valve can conform **242** and seal against the contour of the valve seat **126** when the valve is in its seated (i.e., closed) position. If such conformance is not present, the valve will not seat and seal properly against the valve seat causing leakage.

[0037] The weight **238** inserted into the flapper valve **118** is shaped to approximate the general interior shape of the valve. In an embodiment, a radial slot **244** is cut into the weight. The slot extends approximately midway into the weight and may have an approximate width of 0.1875 inches. The slot facilitates the insertion of the weight into the valve opening as described further herein.

[0038] The weight can be made of any material that has a specific gravity greater than water. Lead which has a specific gravity of 11.3 can be used. However, zinc with a specific gravity of 7.1 or irons with specific gravities between 7.0 to 7.9 can also be used.

[0039] The flush valve **118** can be modified by following the steps of FIG. **7**. In particular, 1) the flush valve from the existing system is removed from the toilet water tank **112**; 2) the flush valve is held so the flush valve opening **136** is facing upwardly; 3) the radial slot **244** of the weight **238** is inserted into the edge of the opening **136**; the weight is pressed and manipulated until the weight falls into the opening with the

concave surface of the weight facing the lower surface of the valve; **4**) and, the modified flush valve is installed in the toilet tank.

[0040] Turning to FIG. **8**, a top partial diagrammatic plan view of a flush controller in accordance with the present invention is depicted. The flush controller **228** includes a housing **350**, a control knob **352**, a drive or timer mechanism **354**, and a pulley **356**.

[0041] The drive or timer mechanism **354** can include conventional design elements for facilitating the automatic release of a cable or chain after a specified period of time. For instance, the timer can include, at least in part, the device disclosed in U.S. Pat. No. 4,469,197 to Minour, incorporated herein by reference. As such, the timer mechanism can include a spring **358** that is installed within a circular recess **360** formed in a frame **362** which is assembled within another frame **364** by snap engagement with each other.

[0042] Reference numeral **366** of FIGS. **8**, **9** and **10** indicates a shaft wherein the knob **352** and pulley **356** are mounted on opposite ends of the shaft. Also mounted on the shaft **366** is a gear **368**, and between the gear **368** and a pinion **370** mounted on a shaft **372** inserted through the frames **362** and **364** there is disposed a gear mechanism **374** for connecting the gear **368** with the pinion **370**.

[0043] Although a single shaft **366** is depicted wherein knob **352** and pulley **356** are connected to opposite ends thereof, it will be appreciated by those having ordinary skill in the art that the controller can be designed so the knob and pulley are mounted on different shafts that are operatively connected together to perform the desired operation as described herein.

[0044] The circular recess **360** is provided with a guide slit **376** through which can be wound the spring, and the shaft **366** with a pointed or rounded head **366***a* is inserted through holes **378**, **378'** of the frames **362**, **364** to hold the spring **358**.

[0045] Gear **368** is provided on its rear side with a spring engaging slit **380** formed by a pair of opposing projections **382**, **382'**.

[0046] On the inner peripheral surface of the circular recess **360** there is formed a plurality of small recesses **384** spaced from each other for receiving the curved rear portion **358***a* of the spring **358**.

[0047] Furthermore, in the drawing **386***a* through **386***e* show each of the gears of the gear mechanism **374**; **388**, **390** and **392** and their support shafts, respectively; **368'** is a gear formed integrally with the gear **368** which is to be engaged with the gear **386***e*.

[0048] In addition, **394** is a cover applied to the frame **362**; **396** are snaps provided on the frame **364** and to be inserted into the recesses **398** of the cover **394** and engage with respective engaging portions **351**.

[0049] The frame **362** is formed with wall faces **353***a*, **353***b* and **353***c* of split circular shape for receiving the gears **374***a*, **374***b*, **374***c*, **374***d* and **374***e*, so that at the time of assembly the gears **368**, **370** and gear mechanism **374** can be held without the shafts **377** and **372**.

[0050] Numeral **355** denotes an insertion hole for the shaft **372**; **357** an insertion slot for the support shaft **388**; **359** an insertion hole for the support shaft **390'**; **361** is an insertion slot for the support shaft **392**; **363** are pins which project from the frame **362** and which are to be inserted into the holes **365** of the cover **394** as well as the holes **367** of the frame **364**.

[0051] Numeral **369** is a guide slit for the spring **358** formed in the frame **362**.

[0052] In an embodiment, the gear **368**, pinion **370** and the gear mechanism **386** are assembled together in the frame **362** and, after the cover **394** has been applied thereto, the frame **364** is assembled to the frame **362** by snap engagement; and after the shaft **372** has been inserted through the hole **355** into the hole **370***a* of the pinion **370** the pointed head of the spring **358** is inserted through the guide slit **369** formed in the frame **362** and further through the guide slit **376** formed in the circular recess **360**, into the slit **380** between the projections **382** and **382'** provided in the gear **368** (FIG. **10**), and thereafter, the shaft **366** for fastening the spring is inserted through the hole **378'** of the frame **364** into the hole **368***a* of the gear **368** whereby the shaft **366** with its pointed head **366***a* will proceed pushing its way through the layers of the leaf spring **358** wherein a portion of the spring **358** will press itself against the shaft **366** and when inserted furthermore the shaft **366** will reach the hole **378** of the frame **362**.

[0053] The shaft **366** is then pressed through an aperture extending through the central axis of pulley **356**. Accordingly, rotation of the shaft **366** results in like rotation of the pulley **356**.

[0054] In an embodiment, the controller housing **350** is made of plastic, metal, or a metal alloy and is generally cylindrical with a cavity **371** for containing the timer **354**. The housing **350** includes a planar front surface **373** that, as shown in FIG. **11**, has indicia **375***a*-**375***d* printed thereon to indicate a desired flush time or duration.

[0055] Like the housing **350**, the control knob **352** is generally cylindrical and can be made of plastic, metal or a metal alloy. The knob **352** has a planar front surface **377** having indicia **379** thereon to show the currently selected flush time or duration.

[0056] The knob **352** is mounted on the distal end of the shaft **366** about the front **373** of the housing **350** and is in coaxial alignment with the shaft, the housing **350** and the pulley **356**. Accordingly, rotation of the knob **352** results in like rotation of the pulley **356** and thus retracts or releases the cable **382** attached to the pulley.

[0057] Directly or indirectly attached to the controller housing **350** is a threaded metal or metal allow rod **379** having a cylindrical passage **381** passing therethrough. In an embodiment, the shaft **366** of the controller extends through the passage **381** in the rod **379**.

[0058] The controller **228** can be attached to the tank **112** of a toilet by removing the pre-existing handle assembly **128**, if present. The threaded rod **379** of the controller can then be inserted into the aperture in the tank that was previously occupied, in part, by the handle assembly **128**. A plastic bolt or the like can be threaded onto the rod **379** to secure the controller **228** to the tank **112**. Then, the pulley **356** can be pressed onto the end of the shaft **366** within the tank **112**.

[0059] The mechanical linkage **230** between the flush controller **228** and the flush valve **216** can be provided by attaching the cable **383** to a preexisting chain **131** attached to the flush valve **216**. Alternatively, the cable **383** can be attached directly to the flush valve **216**. Thus, omitting the chain.

[0060] Turning to FIG. **12**, in an alternative embodiment, the pulley **356** can be located in the cavity of the controller housing **350**. Moreover, the cable **382** can pass through one or more tubular guides **385** wherein one of the guides passes through the threaded attachment rod **379**. Accordingly, the guides provided for directing the cable from the pulley **356** to the inside of the toilet tank **112** when the controller is mounted onto the toilet tank.

[0061] Turning to FIG. **17**, the tubular guide **385** extending inside of the toilet tank from the controller of FIG. **12** can have a plurality of apertures for allowing the cable **383** to pass therefrom. Preferably, the guide **385** is constructed in a conventional manner to allow the guide to bend horizontally, but not vertically. For instance, the guide **385** can be made of copper and contain a plurality of chain linkages attached together such as those used on conventional bike chains. In an embodiment, the guide can pass over the flush valve **216** with the cable **383** extending from the guide to the flush valve. Thus, in this embodiment, the guide assembly **387** can be omitted because it is not needed.

[0062] Turning to FIG. **13**, a guide rod assembly **387** is provided. The assembly **387** is constructed of a pair of plastic tubular members **389** and **391** in longitudinal coaxial alignment with each other. Preferably, a portion of tubular member **389** is received within the cavity of tubular member **391**.

[0063] A coil spring **393** is mounted in the cavity of tubular member **391** wherein the spring is compressed as the tubular members **389**,**391** are pressed together. Accordingly, the length of the guide assembly **387** is adjustable to fit within toilet tanks of various widths. Furthermore, the spring **393** provides for securing installing the assembly **387** in a toilet tank **112** by pressing the ends of the assembly against the inner walls of the tank. In an embodiment, rubber disks **337** can be glued to the ends of the assembly **387** to prevent the assembly from slipping inside the tank.

[0064] Preferably, ears **395** and **397** outwardly extend from the distal ends of the tubular members **389** and **391**, respectively. Preferably, when the assembly **387** is mounted in a toilet tank, the ears **395**,**397** rest on the top of the tank **112** to prevent the assembly from being pulled into the tank **395**,**397** when opening the flush valve.

[0065] In an embodiment, one or more grooves **399** can be formed on the outer surface of the tubular members **389** and **391**. Turning to FIG. **2**, the groove receives, and thus guides, the cable **383** at generally a right angle from the flush controller **228** to a chain **131** attached to the flush valve **216**. Accordingly, more than one groove can be provided on the outer surface of the guide assembly **387** to accommodate toilet tanks of various widths. Moreover, in alternative embodiments depicted in FIGS. **2**A and **2**B, the guide assembly **387** can be positioned to guide the cable **383** from the flush controller **228** to the flush valve **217** at an acute angle or an obtuse angle, respectively.

[0066] Turning to FIG. **13**A, an alternative embodiment is depicted of a support member for the linkage between the flush controller and the flush valve of FIG. **2**B. In particular, the ears **395**,**397** of the guide assembly are spaced from the tubular members **389**,**391** by integral spacer arms **339**. Thus, the tubular members **389**,**391** of the guide assembly are positioned further from the top of the tank **112** than that of FIG. **2**.

[0067] Also, in the guide assembly of FIG. **13**A, the groove **399** (FIG. **13**) on the outside of tubular member **391** has been omitted and replaced by integral nodules **335** having apertures **333** passing therethrough. In an embodiment, the cable **383** from the flush controller **228** is threaded through an aperture **333** in one of the nodules **335** to guide the cable from the flush controller to the chain **131** attached to the flush valve **216**.

[0068] To operate the system, a user twists the knob **353** on the flush controller **228** to a desired marked location on the controller housing **373**. As a result of the user twisting the knob **353**, the pulley rotates to retract the cable **383** and thus open the flush valve **216**.

[0069] When the user releases the knob **353**, the timer assembly **354** automatically (i.e., without human intervention) allows the pulley to slowly rotate in the opposite direction to release the cable **383** and thus close the flush valve **216**. In particular, the rate of rotation of the pulley, and thus release rate of the cable **383**, is determined at least in part by the tension of the spring and the gearing ratio used within the timer **354**, which are directly or indirectly attached to the pulley shaft **366**. Moreover, because the flush valve is non-buoyant, the valve immediately begins to close as the cable is released.

[0070] Accordingly, when a short duration flush is desired, then the user can twist the knob **353** by a small amount. In contrast, when a long flush is desired, then user can twist the knob by a greater amount which, in turn, will result in a longer time (i.e., duration) until the valve is closed.

[0071] As will be appreciated by those having ordinary skill in the art, a spring may not be needed in the timing assembly of the controller **228**. Instead, in an embodiment, the weight of the non-buoyant flush valve and the gearing ratio used within the timer assembly **354** will cause the flush valve **216** to close at a desired rate.

[0072] As will also be appreciated by those having ordinary skill in the art, the cable **383**, pulley **356** and guide assembly **384** can be replaced by a single arm or rod **1483** as depicted in FIG. **16**. In this embodiment, the rod **1483** can be construed of plastic, metal or a metal alloy. One end of the rod can be attached in a conventional manner to the chain **131** extending from the flush valve **216**. Moreover, the opposite end of the rod **1483** can be attached to the shaft **366** extending from the controller **228**. Thus, the mechanical linkage **230** between the flush controller **228** and the flush valve **216** is provided by the rod **1483** and the attached chain **131**.

[0073] Accordingly, rotation of the controller shaft **366** in one direction causes the flush valve **216** to open, and rotation of the controller shaft in the opposite direction allows the flush valve to close.

[0074] Turning to FIG. **11**, in an embodiment, by counterclockwise twisting the knob **353** so indicator **379** points to zone **375***a*, a flush duration of about 3 seconds is provided. Likewise, by counterclockwise twisting the knob **353** so indicator **379** points to zone **375***b*, a flush duration of about 4 seconds is provided. Moreover, by counterclockwise twisting the knob **353** so indicator **379** points to zone **375***c*, a flush duration of about 5 seconds is provided. Further, by counterclockwise twisting the knob **353** so indicator **379** points to zone **375***d* a flush duration of about 6 seconds is provided.

[0075] Turning to FIG. **14**, a simplified functional block diagram is provided of an electronic flush controller **410** in accordance with the present invention. The controller **410** includes a battery **423**, a touchpad **425**, a microcontroller **427** and a solenoid **429**.

[0076] The battery **423** provides power for the controller **410** and can consist of one or more conventional household batteries. Accordingly, the battery **423** may be directly or indirectly operatively connected to the touchpad **425**, microcontroller **427** and solenoid **429** for providing power to these functional blocks of the controller.

[0077] The solenoid **429** is a conventional electromechanical device and provides for retracting and releasing the flush valve **216** upon receiving one or more electrical commands from the microcontroller **427**. Thus, the solenoid can be directly or indirectly attached to the cable **383** via a pulley or other mechanical linkage.

[0078] As indicated previously, the microcontroller **427** provides signals to the solenoid **429** for opening and closing the flush valve **216**. In an embodiment, the microcontroller is a conventional device having a processor, timer, random

access memory and a read-only memory. In an alterative embodiment, the microcontroller is a programmable logic array.

[0079] The microcontroller **427** is operatively coupled to the touchpad to receive commands from a user. In particular, the microcontroller **427** electrically commands the solenoid to open the flush valve for a duration of time based upon a command signal received form the touchpad **425**.

[0080] Turning to FIG. **15**, the touchpad **410** can be a conventional device adhesively attached to the outside of the toilet tank **112** wherein the touchpad sends electrical command signals to the microcontroller **427** corresponding to an area touched by a user. In an embodiment, four areas or zones can be printed on the touchpad wherein, when a user touches area **375***a* an electrical command is sent to the microcontroller to open the flush valve **216** for about 3 seconds. Likewise, by a user touching areas **375***b*, **375***c* and **375***d*, a flush duration of about 4, 5 and 6 seconds is provided, respectively.

[0081] It should be emphasized that the above-described embodiments of the present invention, particularly, any "preferred" embodiments, are possible examples of implementations merely set forth for a clear understanding of the principles for the invention. Many other variations and modifications may be made to the above-described embodiment(s) of the invention without substantially departing from the spirit and principles of the invention. Accordingly, all such modifications are intended to be included herein within the scope of this disclosure and the present invention, and protected by the following claims.

What is claimed is:

1. A system comprising:
- a toilet bowl;
- a toilet tank attached to the toilet bowl so that when a toilet flush occurs, the flush water from the tank drains into the toilet bowel, the tank comprising a bottom surface having a tank drain that includes a valve seat, a flush valve removably mounted on the valve seat made of a resilient material and having a hollow interior with an opening therethrough and having on its upper end an attachment point, and a weight inserted loosely into the flush valve opening where the weight modifies the flush valve so its combined weight exceeds the specific gravity of water to make the valve non-buoyant, wherein the weight is sized to allow a clearance between the circumferential perimeter of the weight and the inner surface of the flush valve so that the flush valve remains resilient near its lower perimeter to allow the valve to conform to and seal against the contour of the valve seat when the valve is in its seated position;
- a controller attached to the toilet tank to select a period of time to open the flush valve;
- a linkage coupled to the controller and the flush valve; and,
- wherein the controller automatically releases the linkage to close the flush valve once the period of time has lapsed.

2. The system of claim **1**, the controller comprising a housing.

3. The system of claim **2**, the controller housing containing a mechanical timer.

4. The system of claim **1**, the controller comprising a knob.

5. The system of claim **1**, the controller comprising a spring.

6. The system of claim **1**, the controller comprising a pulley.

7. The system of claim **1**, the controller comprising a touchpad.

8. A system comprising:
- a toilet bowl;
- a toilet water tank attached to the toilet bowl so that when a toilet flush occurs, the flush water from the tank drains into the toilet bowl, the tank comprising a bottom surface having a tank drain that includes a valve seat, a modified flush valve removably mounted on the valve seat made of a resilient material and having a hollow interior with an opening therethrough and having on its upper end an attachment point operatively connected to the flush handle, and a weight inserted loosely into the flush valve opening and having a radial slot that facilitates the insertion of the weight into the opening where the weight modified the flush valve so its combined weight exceeds the specific gravity of water to make the valve non-buoyant.
- a controller attached to the toilet tank to select a period of time to open the flush valve;
- a linkage coupled to the controller and the flush valve; and,
- wherein the controller automatically releases the linkage to close the flush valve once the period of time has lapsed.

9. The system of claim **8**, the controller comprising a housing.

10. The system of claim **9**, the controller housing containing a mechanical timer.

11. The system of claim **8**, the controller comprising a knob.

12. The system of claim **8**, the controller comprising a spring.

13. The system of claim **8**, the controller comprising a pulley.

14. The system of claim **8**, the controller comprising a touchpad.

15. A method of modifying a toilet flushing system to allow the quantity of water available in a toilet water tank for a toilet flush to be selected by a user, where said system incorporates a standard flush valve having an opening on one end, the method comprising the steps of:
- removing the existing said flush valve from the toilet water tank;
- obtaining a weight sized to loosely fit inside the flush valve;
- inserting the weight through the opening in the flush valve;
- reinstalling the flush valve in the toilet tank.
- attaching a controller to the toilet tank;
- coupling a linkage to the flush valve from the controller;
- selecting a period of time to open the flush valve; and,
- automatically releasing the linkage to close the flush valve once the period of time has lapsed.

16. The method of claim **15**, the controller comprising a housing.

17. The method of claim **15**, the controller comprising a knob.

18. The method of claim **15**, the controller comprising a spring.

19. The method of claim **15**, the controller comprising a pulley.

20. The method of claim **15**, the controller comprising a touchpad.

* * * * *