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Gaw

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[54] **DUAL FLUSH MECHANISM FOR A TOILET**

[76] Inventor: **Stanley E. Gaw**, 124 Berwick Pl., Lansdale, Pa. 19446

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[51] **Int. Cl.**[6] **E03D 1/14**

[52] **U.S. Cl.** **4/325**

[58] **Field of Search** 4/324, 325, 326, 4/405, 411, 412

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Primary Examiner—Charles E. Phillips
Attorney, Agent, or Firm—Eric A. LaMorte

[57] **ABSTRACT**

A flush control mechanism for a toilet and associated method that enables the toilet to be flushed with either a long flush cycle for solid wastes or a short flush cycle for liquid wastes. The present invention includes a nonbouyant flush valve that controls the duration of the flush cycle. A handle assembly is provided that is rotatably manipulative around its longitudinal axis from a set orientation to a rotated orientation. The handle assembly is also reciprocally manipulative along its longitudinal axis from an extended position to a retracted position. A first mechanism is coupled to the handle assembly and the flush valve for temporarily maintaining the flush valve in an open condition when the handle assembly is rotated into its rotated orientation. The flush valve remains open until the tank drains to a first level. A second mechanism is coupled to the handle assembly for temporarily maintaining the flush valve in an open condition when the handle assembly is manipulated into its retracted position and is rotated into its rotated orientation. The second mechanism acts to hold the flush valve open until the tank drains to a second level or empties completely.

9 Claims, 4 Drawing Sheets

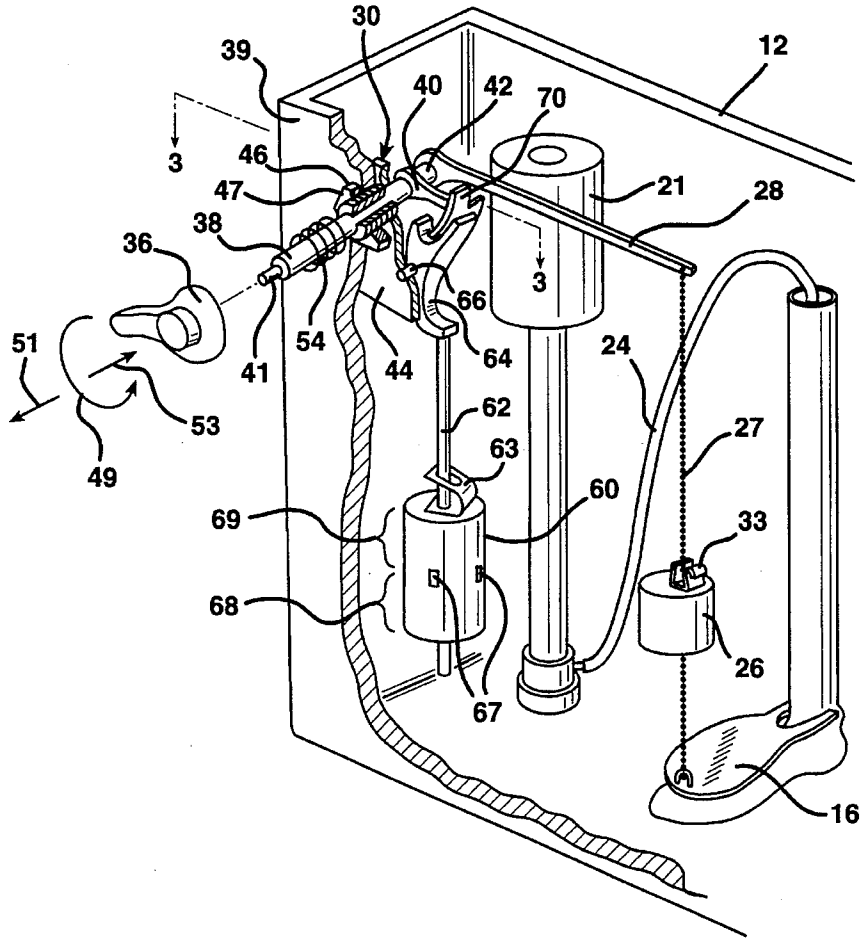

FIG. 1

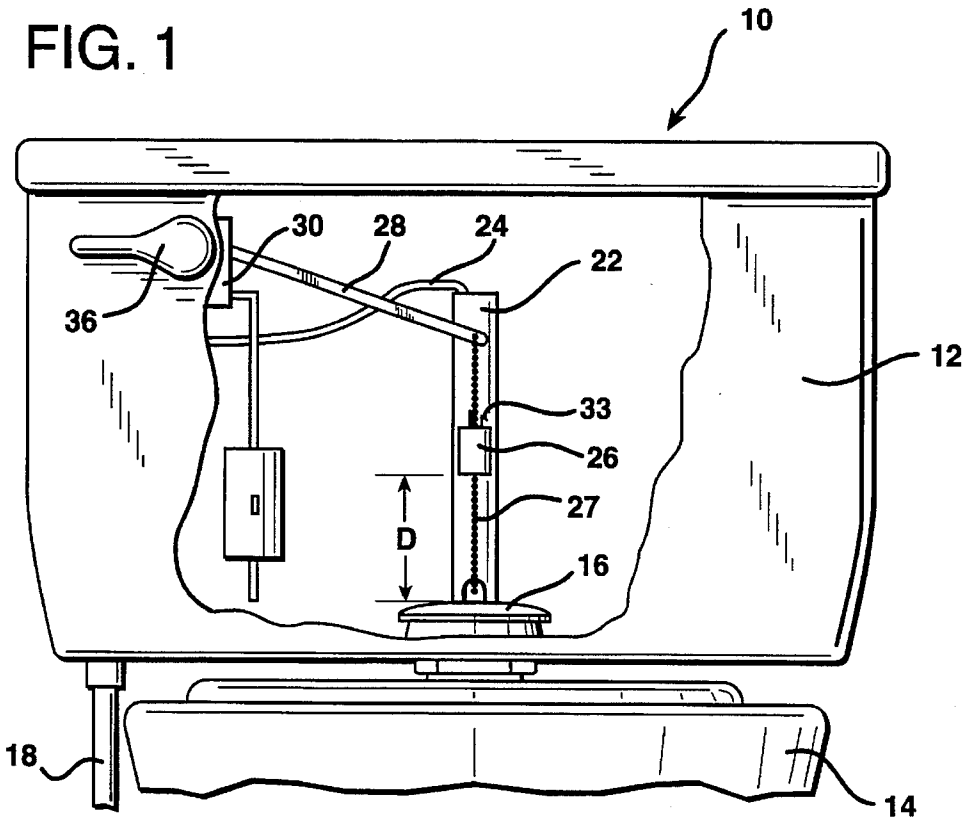

FIG. 6

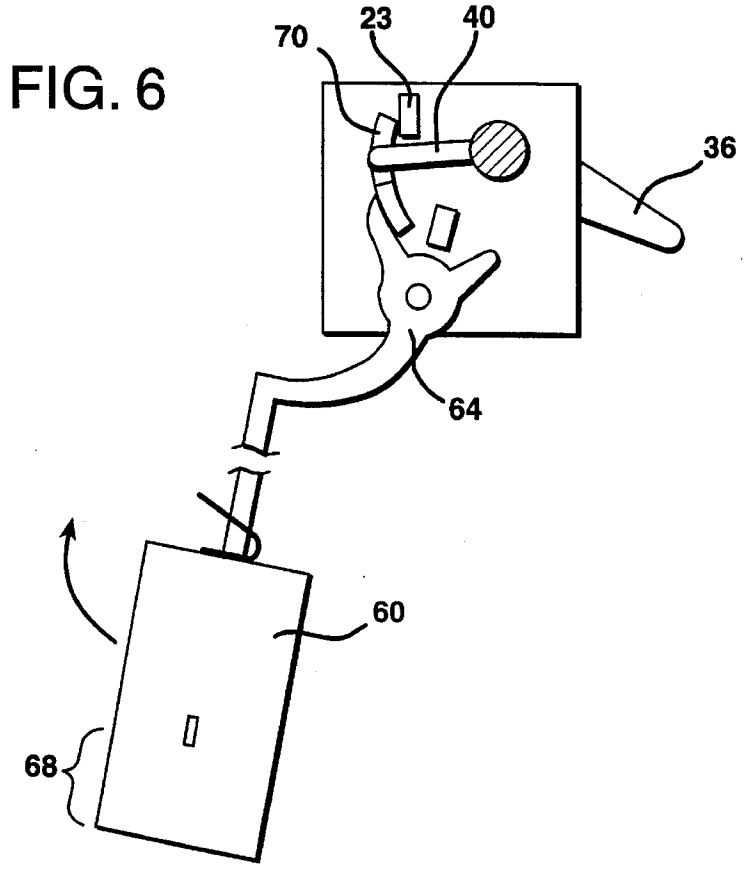

FIG. 2

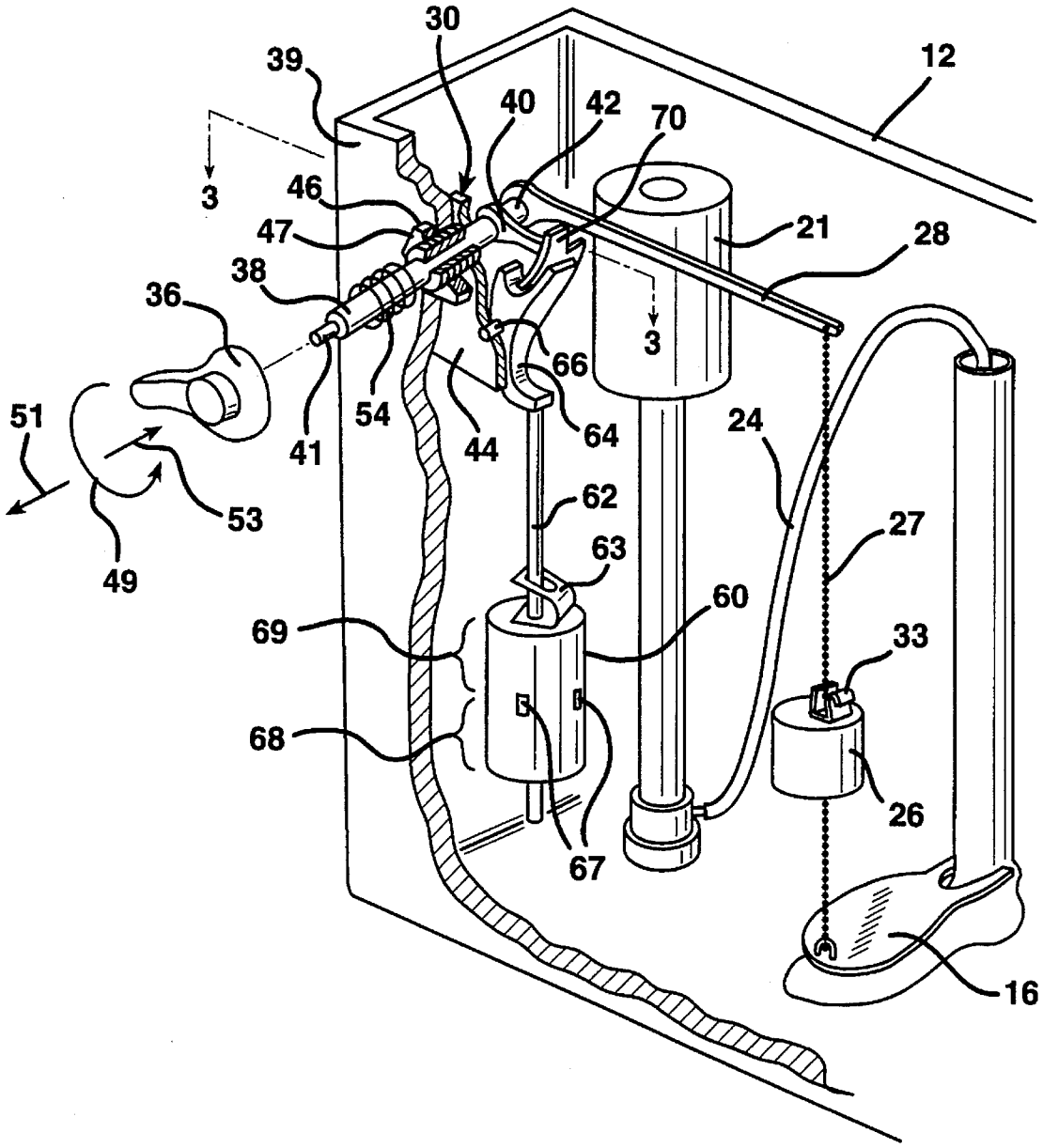
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FIG. 3

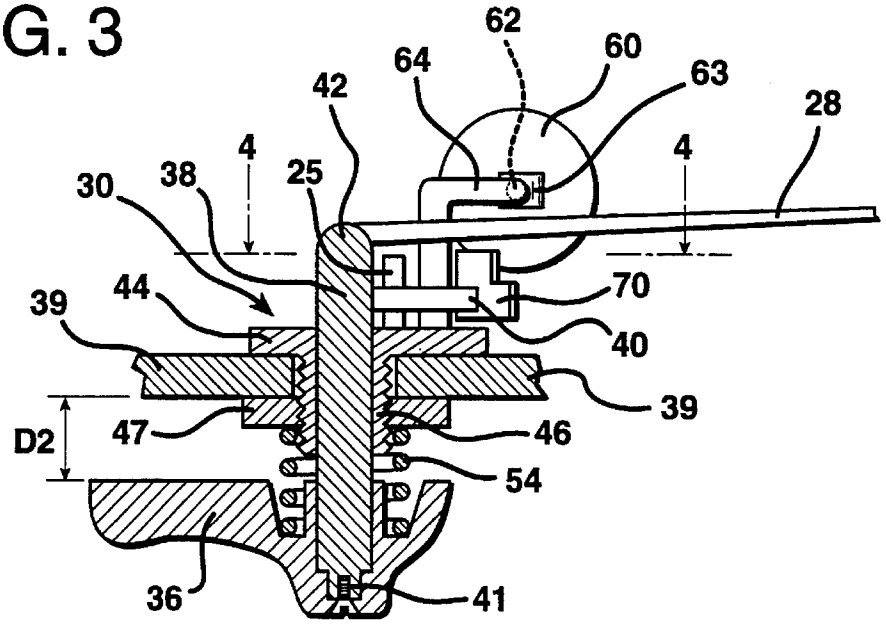


FIG. 4

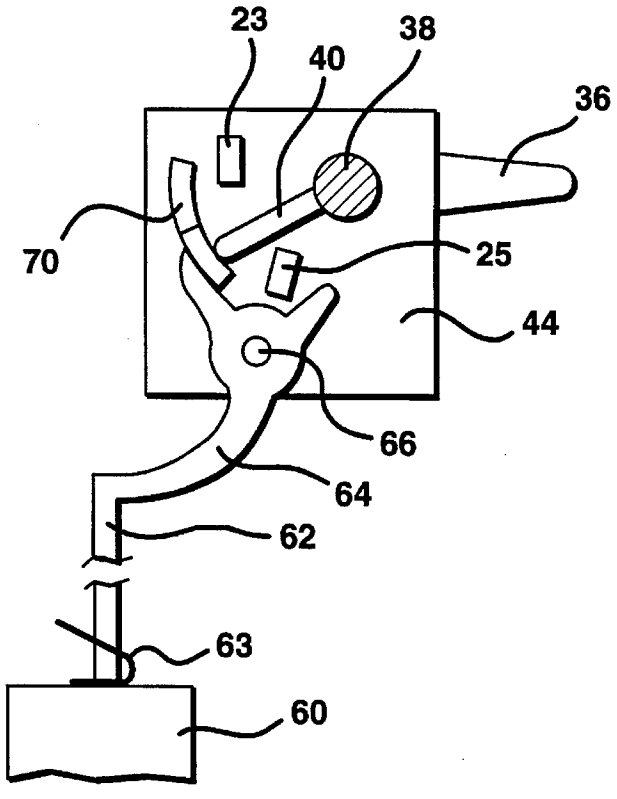


FIG. 5

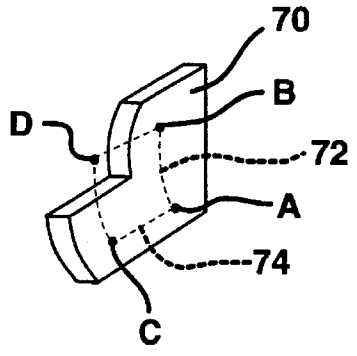
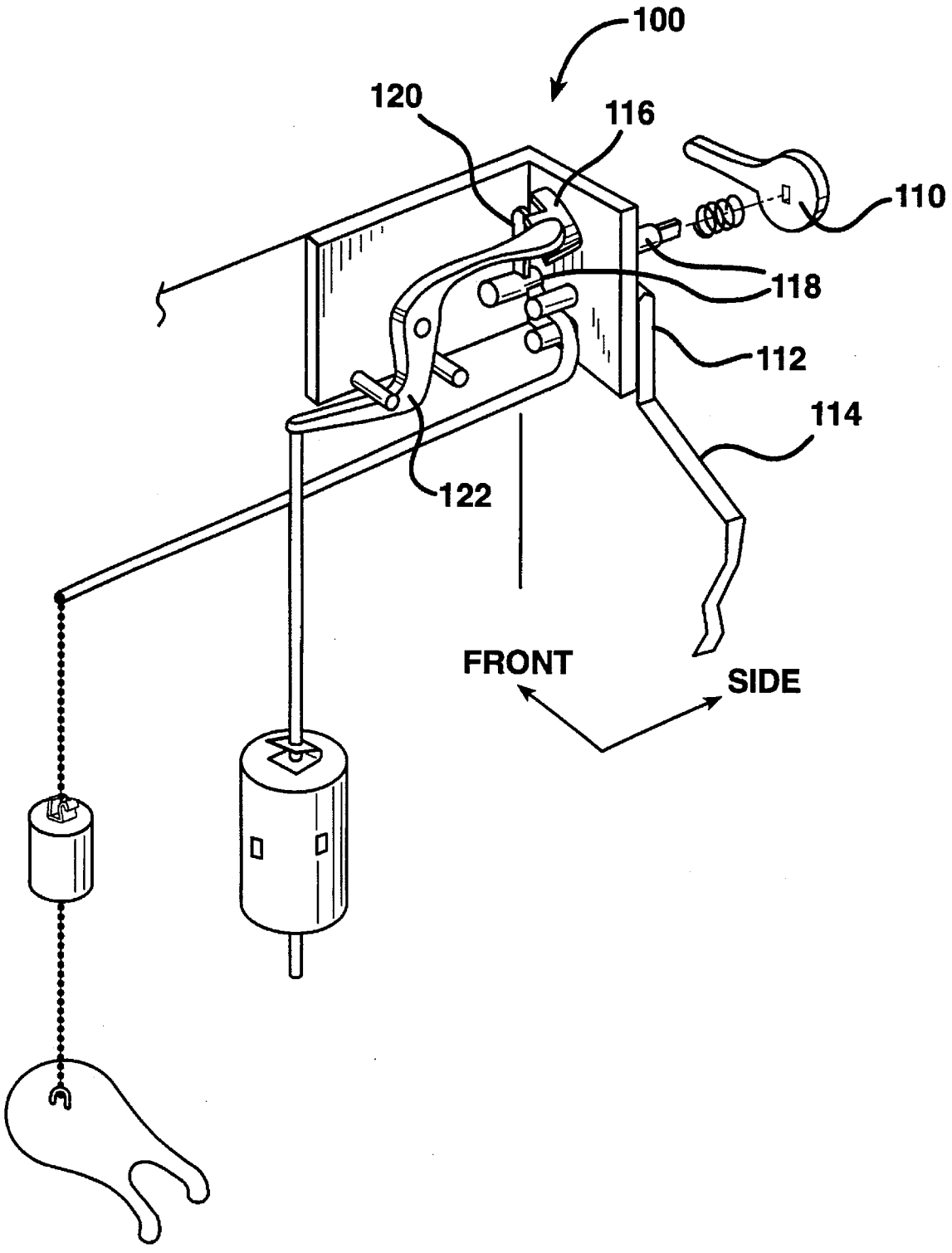


FIG. 7



DUAL FLUSH MECHANISM FOR A TOILET

BACKGROUND

1. Field of the Invention

The present invention relates to the flush mechanisms used in toilets. More specifically, the present invention relates to flush mechanisms that can be used to selectively create a short flush cycle for liquid waste and a long flush cycle for solid waste, thereby conserving water.

2. Prior Art Description

The primary cause of domestic water use is the operation of the toilet. Due to the frequency and scale of recent water shortages, considerable interest has been focused upon limiting the amount of water a toilet uses.

Over the years, many devices for reducing the flush volume of a toilet have been invented. The simplest such method is to place water displacing objects into the toilet tank. However, in many cases, this approach is problematic due to the limited space available in the toilet tank and the interference created with the arrangements of the tank hardware. Another approach to saving water is to provide the toilet with two flush cycles. A long flush cycle is used to remove solid wastes and a short flush cycle is used to remove liquid wastes. Such prior art is exemplified by U.S. Pat. No. 3,964,109 to Street et al., entitled FLUSH VALUE ASSEMBLY; U.S. Pat. No. 4,881,279 to Harney, entitled DUAL FLUSH MECHANISM; U.S. Pat. No. 4,141,092 to Jones, entitled DUAL-FLUSH, TANK ACTUATING DEVICE; and U.S. Pat. No. 4,483,024 to Troeh, entitled VARIABLE FLUSH WATER CLOSET.

However, there are several disadvantages to such prior art variable flush mechanisms. Many prior art devices are structurally unreliable and cannot be used in a domestic setting. Other prior art devices only fit limited tank configurations, while others require specialized overflow stack and valve seat assemblies. The most common disadvantage embodied by prior art devices is that they do not encourage the use of the short flush cycle, have no adjustments or have only short flush cycle adjustments. Similarly, many such prior art devices are difficult to install or too costly for general use.

The need therefore exists in the art for a toilet flush device that provides an inducement to use the short flush cycle, easy to install and is cost effective.

The need also exists for a toilet flush device that has easily adjusted long flush and short flush cycles so the device can be adjusted to the needs of the user.

SUMMARY

The present invention is a flush control mechanism for a toilet and associated method that enables the toilet to be flushed with either a long flush cycle for solid wastes or a short flush cycle for liquid wastes. The present invention includes a nonbouyant flush valve that controls the duration of the flush cycle. A handle assembly is provided that is rotatably manipulative around its longitudinal axis from a set orientation to a rotated orientation. The handle assembly is also reciprocally manipulative along its longitudinal axis from an extended position to a retracted position. A first mechanism is coupled to the handle assembly and the flush valve for temporarily maintaining the flush valve in an open condition when the handle assembly is rotated into its rotated orientation. The flush valve remains open until the tank drains to a first level. A second mechanism is coupled to the handle assembly for temporarily maintaining the flush valve in an open condition when the handle assembly is manipulated into its retracted position and is rotated into its rotated orientation. The second mechanism acts to hold the flush valve open until the tank drains to a second level or empties completely.

Both the first mechanism and the second mechanism are adjustable. As such, the amount of water released in either the short flush cycle or the long flush cycle can be selectively adjusted to meet the needs of the user.

BRIEF DESCRIPTION OF THE DRAWINGS

For a better understanding of the present invention, reference is made to the following description of exemplary embodiments thereof, considered in conjunction with the accompanying drawings, in which:

FIG. **1** is a segmented forward view of one preferred embodiment of the present invention flush mechanism shown in conjunction with a toilet tank and bowl to promote consideration and discussion;

FIG. **2** is a perspective view of the embodiment shown in FIG. **1** with selected segmentation to better show the components contained therein;

FIG. **3** is a cross-sectional view of the embodiment shown in FIG. **2**, viewed along section line **3–3**;

FIG. **4** is a cross-sectional view of the embodiment shown in FIG. **3**, viewed along section line **4—4**;

FIG. **5** is an isolated view of the contact plate component of the present invention;

FIG. **6** is a cross-sectional view of the embodiment shown in FIG. **3**, viewed along section line **4—4**, shown during a long flush cycle; and

FIG. **7** shows an alternate embodiment of the present invention flush mechanism.

DETAILED DESCRIPTION OF THE INVENTION

Referring to FIG. **1**, there is shown one preferred embodiment of the present invention flush mechanism installed within a common toilet **10**. As with most toilets, the shown embodiment includes a flush tank **12** and a bowl **14**. The flush tank **12** retains a predetermined volume of water that is released into the bowl **14** when the flush valve **16** between the flush tank **12** and the bowl **14** is opened. The flush tank **12** refills when the flush valve **16** closes. Water is supplied by the water inlet pipe **18**, whereby the flush tank **12** is again filled with the predetermined volume of water. The filling of the flush tank **12** is controlled by the inlet valve assembly **21** (shown in FIG. **2**), overflow assembly **22** and fill tube **24** which are all well known components of a conventional prior art toilet.

In the present invention, the flush valve **16** is not buoyant. As such, gravity and water pressure bias the flush valve **16** into a closed position that prevents water from flowing into the bowl **14** from the flush tank **12**. The flush valve **16** is coupled to an elongated flush activation arm **28** via a flexible connecting element **27**. A flush float **26** is coupled to the flexible connecting element **27** at a distance D from the flush valve **16**. The flush float **26** is sized to provide a buoyant force to the flush valve **16** that is sufficient to maintain the flush valve **16** in an open position, once the flush valve **16** is open, however, the buoyant force is not sufficient to open the flush valve **16** when it is closed. A clip **33** is disposed on

the upper surface of the flush float **26**. The clip **33** selectively engages the flexible connecting element **27** at any point along its length. As such, the distance D between the flush valve **16** and the flush float **26** can be selectively adjusted for a purpose which will be later explained.

The flush activation arm **28** extends from the flush control assembly **30**. As will be later explained, the flush control assembly **30** is controlled by the various different manipulations of the handle **36**, whereby the flush valve **16** can be lifted for a short period of time (i.e. short flush), where only a small amount of the flush tank **12** is drained, or the flush valve **16** can be lifted for a long time (i.e. long flush), where a larger portion of the flush tank **12** is drained.

Referring to FIG. **2** in conjunction with FIG. **3**, it can be seen that the flush control assembly **30** includes a shaft **38** that extends through the forward wall **39** of the flush tank **12**. The proximal end **41** of the shaft **38** is shaped to receive the handle **36**. The distal end **42** of the shaft **38** is coupled to the flush activation arm **28** so that the flush activation arm **28** extends substantially at a perpendicular from the longitudinal axis of the shaft **38**. As a result, it should be understood that by rotating the handle **36**, the shaft **38** can be rotated and the flush activation arm **28** can be caused to lift the flush valve **16** from the shown closed position into an open position.

A control bar **40** also extends from the shaft **38** at a point within the flush tank **12**. The control bar **40** is firmly affixed to the shaft **38**, as such, the control bar **40** also turns as the handle **36** is turned and the shaft **38** turns. The shaft **38** passes through a support member **44**. The support member **44** includes a threaded element **46** that extends through the forward wall **39** of the flush tank **12** and is engaged by a locking nut **47**. As a result, the support member **44** is firmly anchored to the forward wall **39** of the flush tank **12**. The shaft **38** extends through the center of the threaded element **46** of the support member **44**. However, the shaft **38** is not engaged by the support member **44**. As a result, the shaft **38** is free to rotate independently of the support member **44** along the arcuate path of arrow **49**. Similarly, the shaft **38** is also free to move reciprocally back and forth in the directions of arrows **51** and **53**. Two stops **23**, **25** extend outwardly from the support member **44**. The control bar **40** is disposed between the two stops **23**, **25**. As a result, the contact between the stops **23**, **25** and the control bar **40** define the range across which the shaft **38** can be rotated. The reciprocal movement of the shaft **38**, however is limited in the direction of arrow **51** by the contact between the control bar **40** and the support member **44**. Adversely, the reciprocal movement of the shaft **38** is limited in the direction of arrow **53** by the contact between the handle **36** and the threaded element **46** of the support member **44**.

A spring **54** is disposed around the shaft **38** on the outside of the flush tank **12** between the handle **36** and the locking nut **47**. The spring **54** biases the handle **36** into a position that is a distance D2 from the forward wall **39** of the flush tank **12**.

A second flush float **60** is also present within the flush tank **12**. The second flush float **60** is positioned on a rod **62**. A clip **63** joins the second flush float **60** to the rod **62** so that the second flush float **60** can be selectively positioned at any point along the rod **62**. The rod **62** joins to a pivot assembly **64** that rotates around a pivot pin **66**. The pivot pin **66** is a small structure that extends out of the support member **44**. Apertures **67** are formed in the second flush float **60**. As a result, when the second flush float **60** is submerged, the lower portion **68** of the second flush float **60** is flooded while the upper portion **69** of the second flush float **60** retains a cushion of air.

A contact plate **70** is disposed on the pivot assembly **64**. Referring to FIG. **4**, it can be seen that the contact plate **70** is curved to generally match the arcuate path traveled by the distal end of the control bar **40** that extends from the shaft **38**. When the second flush float **60** is submerged, the second flush float **60** creates a buoyant force that pushes the rod **62** upward. This action causes the pivot assembly **64** to pivot in a clockwise direction around pivot pin **66**. This rotation biases the contact plate **70** against the control bar **40** wherein the contact plate **70** abuts against the control bar **40**.

Referring to FIG. **5**, a segment view of the contact plate **70** is shown. As can be seen, the contact plate **70** is shaped like a curved square having the upper left most quadrant removed.

OPERATION

In FIG. **3**, the handle **36** is shown biased into a set position by spring **54** and the weight of the flush activation arm **28**. Returning to FIGS. **4** and **5**, it will be understood that when the handle **36** is at this nominal set position, the control bar **40** contacts the contact plate **70** at point A (FIG. **5**). As a person turns the handle **36** to flush the toilet, the control bar **40** moves from point A to point B along line **72**. The weight of the flush activation arm **28** provides a rotational bias to shaft **38** that acts to return the shaft **38** to its nominal position. Consequently, once the handle **36** is released, the control bar **40** immediately returns to point A from point B.

Looking to FIG. **2**, it will be understood that the turning of the handle **36** in the manner just described, rotates the flush activation arm **28** to lift the flush valve **16** into an open position. Once open, the first flush float **26** holds the flush valve **16** open until the water in the flush tank **12** drops below the level of the first flush float **26**. Gravity then causes the flush valve **16** to close and the flush tank refills. Since the first flush float **26** is suspended at a point near the middle of the flush tank **12**, it will be understood that only some of the water in the flush tank **12** is released before the flush valve **16** again closes. It will therefore also be understood that by selectively adjusting the distance D (FIG. **1**) between the first flush float **26** and the flush valve **16** the length of the short flush can be selectively controlled.

To perform a long flush, the handle **36** is pushed forward toward the flush tank **12** and against the bias of the spring **54**. This causes the control bar **40** to move from nominal point A to point C along line **74** (see FIG. **5**). Once pressed into point C, if the handle is turned, the control bar **40** moves to point D from point C. Once at this location, the contact plate **70** no longer engages the control bar **40**. Additionally, the rotation of the handle causes the flush activation arm **28** to lift the flush valve **16** to an open position as previously described.

Referring to FIG. **6**, it can be seen that when the control bar **40** is at point D (FIG. **5**) and does not abut against the contact plate **70**, there is nothing present to stop the rotation of the pivot assembly **64**. Accordingly, the buoyant force created by the second flush float **60** rotates the pivot assembly **64** clockwise as shown, and the contact plate **70** passes under the control bar **40**. Once the handle **36** is released, the presence of the contact plate **70** under the control bar **40** prevents the control bar **40** from rotating back to its nominal starting position. As such, the control bar **40** is maintained at an elevated position, thereby causing the flush activation arm **28** (FIG. **2**) to be maintained at an elevated position. The

flush activation arm **28** therefore holds the flush valve **16** open even after the water level descends below the level of the first flush float **26**.

As the water level within the flush tank **12** descends below the level of the second flush float **60**, the buoyant force is removed and the weight of the second flush float **60** causes the pivot assembly **64** to rotate counterclockwise. The weight of the second flush float **60** is increased by the water trapped in the lower portion **68** of the flush float **60**. As the pivot assembly **64** rotates counterclockwise, the contact plate **70** moves out from below the control arm **40**. The control arm **40** then returns to position A (FIG. **5**) and the flush activation arm **28** allows the flush valve **16** to close. The flush tank **12** then refills and the toilet is ready for another long flush or short flush. It will also be understood that by varying the position of the second flush float **60**, the length of the long flush and thus the volume of water drained can be selectively controlled.

Referring to FIG. **7**, an alternate embodiment of the present invention **100** is shown. In this embodiment, the handle **110** extends out of the side wall **112** of a toilet's flush tank **114**. The shown embodiment works in the same manner as the embodiment of FIGS. **1–6**, however the contact plate **116** is now oriented above the shaft **118** and the control bar **120** extends upwardly to engage the contact plate **116**. The pivot assembly **122** is shaped to compensate for the change in orientations, however the operation of the overall assembly remains the same as has been previously explained.

It will be understood that the present invention flush control apparatus described in conjunction with the various drawings is merely exemplary and a person skilled in the art of flush mechanisms may make numerous variations and modifications to the shown embodiments utilizing functionally equivalent components to those described. All such variations and modifications are intended to be included within the scope of the invention as defined by the appended claims.

What is claimed is:

1. In a toilet having a flush tank and a bowl, a flush control device, comprising:

a nonbouyant flush valve positionable between an open condition and a closed condition, wherein said flush valve regulates the flow of water from the tank to the bowl;

at least one first float coupled to said flush valve, wherein said at least one first float is disposed at a first depth in the tank and provides a first buoyant force when submerged that is sufficient to maintain said flush valve in said open condition but is insufficient to change said flush valve from said closed position to said open condition;

an elongated member extending through a wall of the tank, said elongated member having a longitudinal axis wherein said elongated member is rotatably manipulable around said longitudinal axis from a set orientation to a rotated orientation and said elongated member is reciprocally manipulated along said longitudinal axis from an extended position to a retracted position;

a flush arm member affixed to said elongated member, said flush arm member being coupled to said flush valve, whereby said flush arm member causes said flush valve to change from said closed position to said open position when said elongated member is rotated from set orientation to said rotated orientation;

at least one second float disposed at a second depth in the tank that is lower than said first depth of said at least one first float, wherein said at least one second float provides a second buoyant force when submerged;

engagement means coupled to said at least one second float, wherein said second buoyant force of said at least one second float causes said engagement means to act upon said elongated member and prevent said elongated member from returning from said rotated orientation to said set orientation when said elongated member is manipulated to said rotated orientation and said retracted position, whereby said flush valve is held in said open condition until said at least one second float is no longer submerged.

2. The device according to claim **1**, further including a means for biasing said elongated member into said set orientation and said extended position.

3. The device according to claim **1**, further including a means for selectively adjusting said first depth of said at least one first float.

4. The device according to claim **3**, further including a means for selectively adjusting said second depth of said at least one second float.

5. The device according to claim **1**, further including a control arm member affixed to said elongated member, wherein said engagement means engages said control arm member thereby causing said engagement means to act upon said elongated member.

6. A flush control device for a toilet tank, comprising:

a handle assembly manipulative between both a first rotated position **5** and a second rotated position and an extended position and a retracted position;

a flush valve positionable between an open condition and a closed position;

first means coupled to said handle assembly and said flush valve for temporarily maintaining said flush valve in said open condition, when said handle assembly is manipulated to said second rotated position, until the fluid level of the tank drains to a first level;

second means coupled to said handle assembly for temporarily maintaining said flush valve in said open condition, when said handle assembly is manipulated to said second rotated position and said retracted position, until the fluid level of the tank drains to a second level lower than said first level; and

first adjustment means for adjusting the depth of said first level.

7. The device according to claim **6**, wherein said flush valve is nonbouyant and said first means includes a float coupled to said flush valve that is capable of maintaining said flush valve in said open condition when submerged, but is incapable of moving said flush valve from said closed position.

8. The device according to claim **6** further including a second adjustment means for adjusting the depth of said second level.

9. The device according to claim **6**, further including a spring means for biasing said handle assembly into said extended position.

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