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Davis, Jr.

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[54] TOILET LID OR LID AND SEAT CLOSER

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[51] **Int. Cl.** **A47k 13/10**
[58] **Field of Search** 4/248, 251, 250, 4/249, 228, 236

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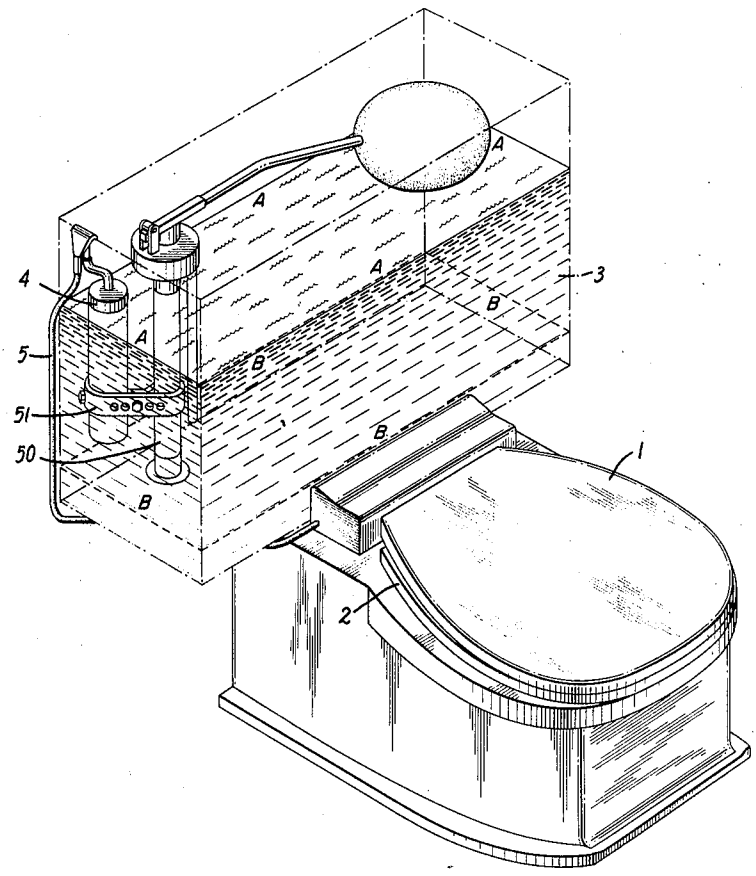
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[57] **ABSTRACT**

A toilet lid or lid and seat closer device for tank-type toilets comprises pneumatic means actuable upon flushing of the toilet for moving the raised toilet lid or lid and seat from a position behind the vertical to a position forward of the vertical and gravity restraining means for gradually lowering the toilet lid or lid and seat to the closed position.

7 Claims, 4 Drawing Figures



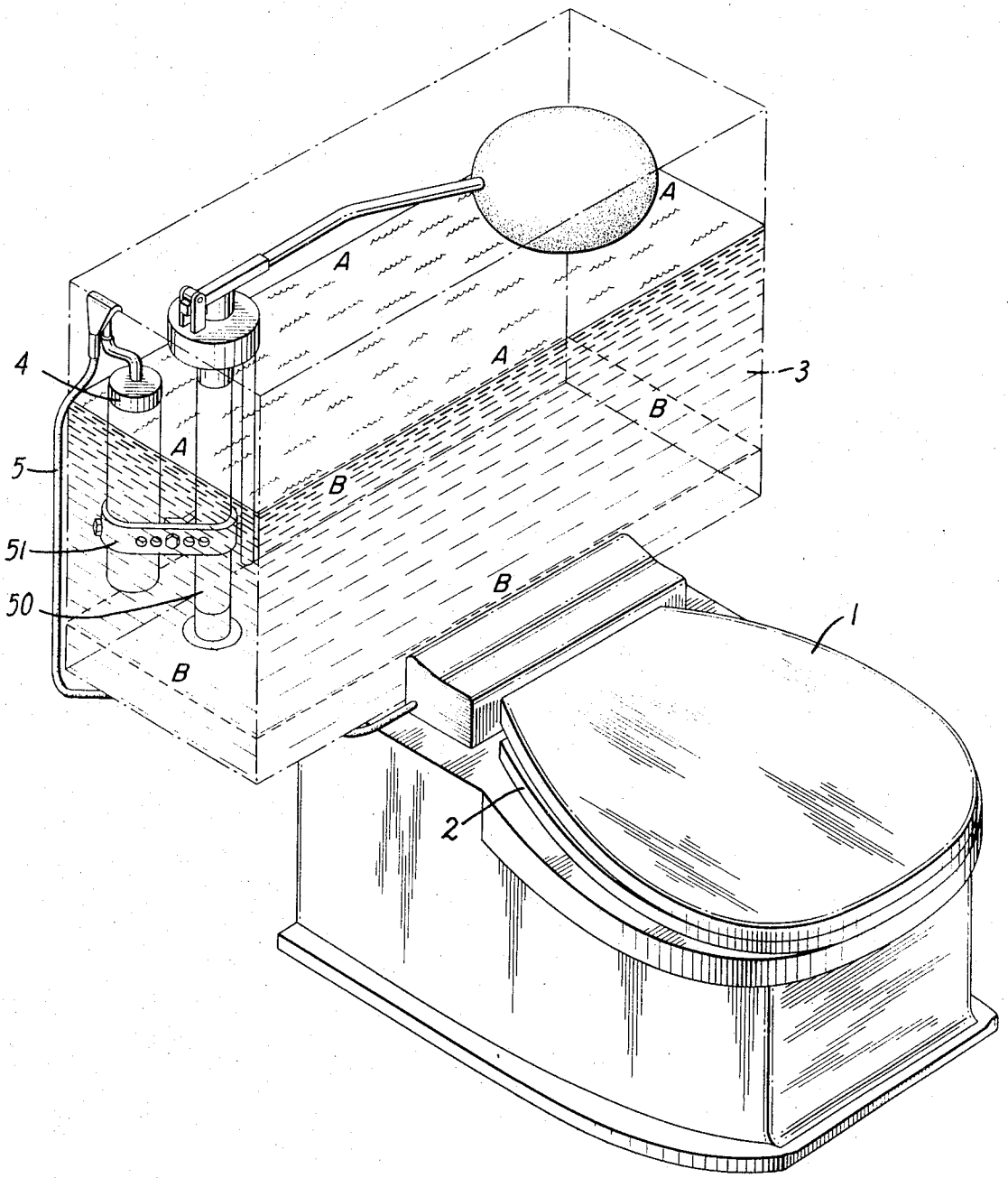


FIG. 1

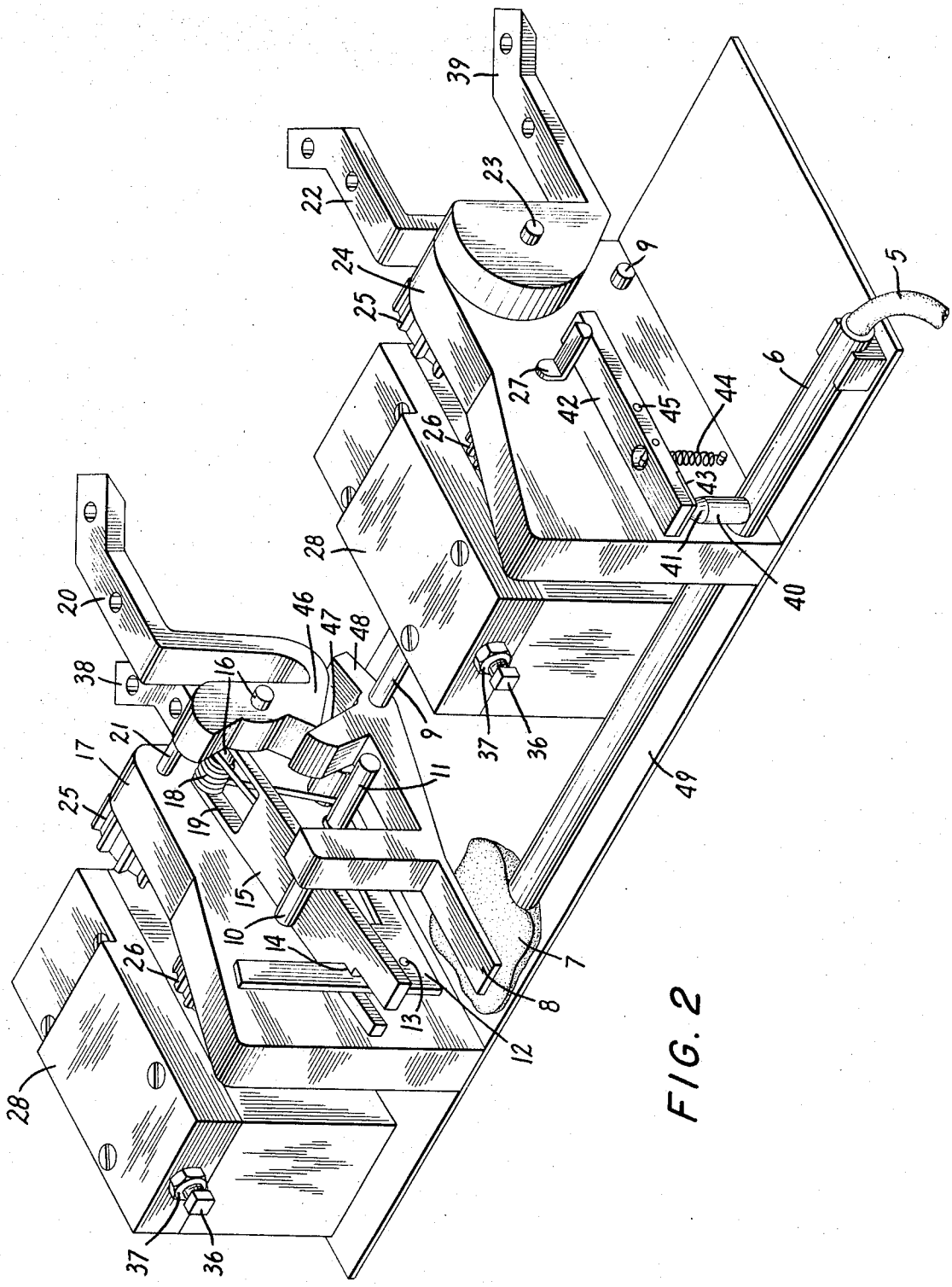

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FIG. 2

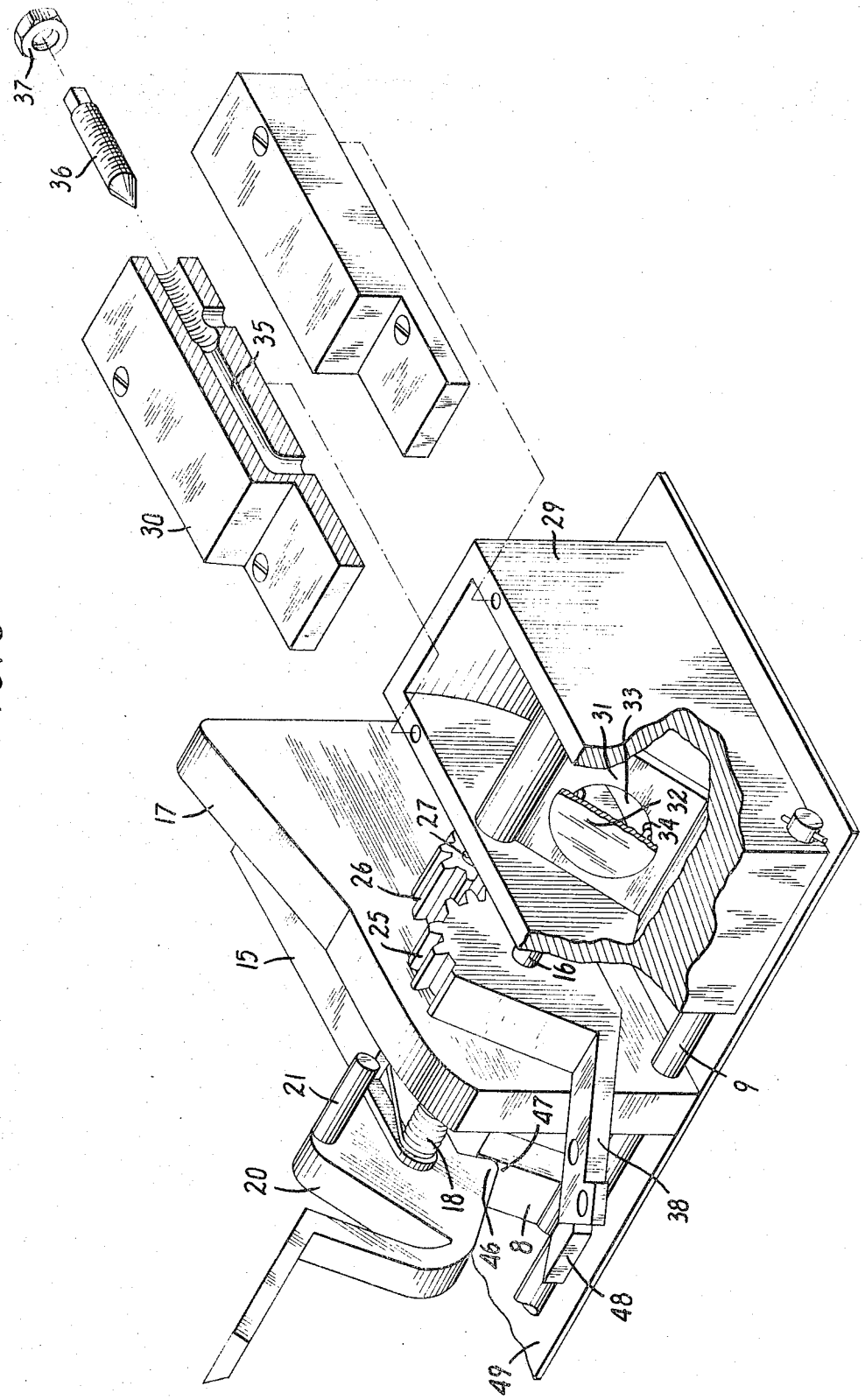


FIG. 3

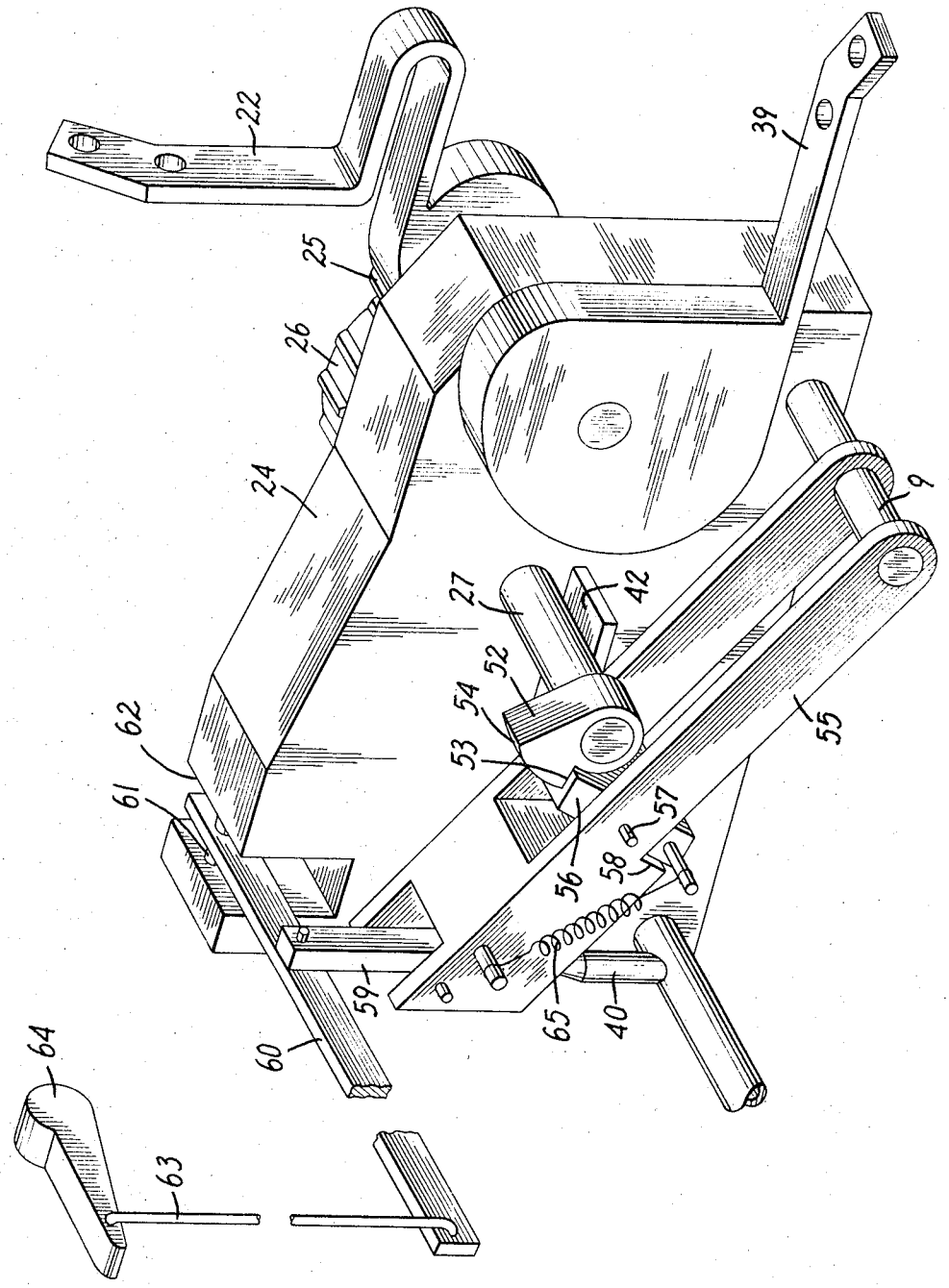


FIG. 4

TOILET LID OR LID AND SEAT CLOSER

SUMMARY OF THE INVENTION

The present invention pertains to a toilet lid or lid and seat closer for tank-type toilets. Prior devices have related to both lifters and closers for a toilet seat and lid, but this invention is specifically for the purpose of only automatically closing a toilet lid or lid and seat.

Many of the prior art devices have emphasized the sanitary aspect of not touching the toilet lid or seat to raise them. However, when most persons are confronted with that situation, they raise the lid or lid and seat by foot or with a piece of tissue. The present invention is mainly concerned with the aesthetic appearance of a toilet that has had its lid or lid and seat left open or raised. With the single action of flushing the toilet, the closing mechanism takes over and automatically closes the lid or lid and seat quietly and gradually without fear of water leakage. A portion of the closer fits conveniently atop the rear of the bowl between the back of the seat and the water tank and is no wider or taller than the conventional seat plus lid while the other portion of the closer fits within the water tank.

The main object of this invention is to provide an automatic toilet lid or lid and seat closer that can be installed on most conventional tank-type toilets without an objectionable appearance.

A further object of the invention is to provide an automatic toilet lid or lid and seat closer that does not require a connection to a water main thereby precluding any possibility of water leakage.

Another object is to provide an automatic toilet lid or lid and seat closer that is economical and will not require any modification to the conventional tank-type toilet and can be installed with simple tools by laymen.

Still another object is to provide an automatic toilet lid or lid and seat closer that offers a delay between the time the toilet is flushed and the time closing is started.

An additional object of this invention is to provide an automatic toilet lid or lid and seat closer so that the lid or lid and seat can be closed either automatically or manually without any extra operations or devices to be actuated by the user.

GENERAL DESCRIPTION OF THE INVENTION

This automatic toilet closer can be installed on any conventional tank-type toilet. The lid or lid and seat are raised by hand in the usual manner. When the toilet is flushed, water leaving the tank or closet empties an open-bottomed cylindrical container therein whose bottom is located in the tank below the full water level but slightly above the low water level. As water refills the tank, air entrapped in the open-bottomed container is forced by compression through flexible tubing attached to the top of the container into a small expandable chamber located below and behind a lid hinge. The inflated or expanded chamber pressing against a latch release and reset arm disengages a latch restraining a spring-loaded arm, which in turn, presses against a closer pin of a hinge and pushes the raised lid (and seat if the seat is also raised) from a position behind the vertical to a position forward of the vertical. Gravity then lowers the lid or lid and seat to the closed position.

The lid or lid and seat are gradually lowered and thus prevented from slamming by gravity restraining means, namely, two dash-pots separately linked to the lid and seat hinges. Each dash-pot contains a vane which is rotated 180° through a viscous fluid, such as a high viscosity oil. The vanes are rotated by the rotating hinges through a pair of matching gears. A gear ratio of 2 to 1 is used to rotate the vane 180° while the hinges are rotating 90° for the closing cycle. Each vane is fitted with a check valve to allow unrestricted movement when the lid or lid and seat are manually raised.

A cam on a lid hinge presses against the latch release and reset arm during the final stages of lid closing which resets the latch and spring-loaded arm. This resetting precludes raising the lid against the force of the spring.

A relief valve on the tubing into the expandable chamber deflates the expanded chamber when the lid starts to close. A cam on the lid vane gear shaft opens the relief valve. The expanded chamber must deflate so that the latch and spring-loaded arm will reset before the lid can be raised.

Nothing in the closer device of the invention will prevent manual closing of the seat or lid and seat at any time. All equipment, except the container in the tank and the tubing, is located atop the rear of the toilet bowl between the back of the seat and the water tank. Its overall height is less than three inches and a suitable cover or housing hides the mechanism from view.

DESCRIPTION OF THE DRAWINGS

The closer device of the invention will be further described and illustrated in connection with the accompanying drawings wherein:

FIG. 1 is a perspective view of a tank-type toilet with the tank partly in section showing the location of the tank and bowl portions of the closer device;

FIG. 2 is a perspective rear view of the uncovered bowl portion of the closer device;

FIG. 3 is an exploded perspective front view partly in section of the right hand section of the bowl portion of the closer device; and

FIG. 4 is a perspective front view of the left hand section of another embodiment or modification of the bowl portion of the closer device.

DETAILED DESCRIPTION OF THE INVENTION

The toilet lid 1 or the lid 1 and seat 2 are raised by hand to a position behind the vertical prior to the use of the toilet. After use, the toilet is flushed, which causes the full water level A in the tank 3 to fall to low water level B. This causes the water in open-bottomed cylindrical container 4 to empty and fill with air.

The open-bottomed container 4 of the water tank portion of the closer device is supported in the tank 3 with the open bottom above the low water level B. It is anchored to the tank fill pipe 50 by a suitable strap 51. Flexible tubing 5 connects to the top of the container 4 and is led out of tank 3 over its top rim, or in some later model toilets through openings in the rear of tank 3. Where the tubing 5 passes over the top rim of tank 3, it is protected from being crushed by the tank cover by suitable shims placed between the top rim and the cover.

As the flushing cycle continues and the tank begins to refill with water, the air is trapped in the container 4 and is forced out at the top into the flexible tubing 5 which leads to the bowl portion of the closer device. The flexible tubing 5 terminates at the rigid tubing 6.

An expandable chamber 7, such as a balloon or bellows, is attached to the other end of rigid tubing 6 and

the air forced by the rising head of water in tank 3 inflates or expands the expandable chamber 7. The expandable chamber 7 is located beneath the rear end of a latch release and reset arm 8, which is supported and pivoted from a support pin 9 and has a catch finger 10 mounted at right angles to its pivot plane. The inflated or expanded chamber 7 raises the latch release and reset arm 8, which in turn raises a trigger 11 resting on it, and which is attached at right angles to a latch 12. Latch 12 is pivoted and supported by latch pin 13. As the latch 12 pivots, the notch 14, located in latch 12 above and slightly to the rear of latch pin 13, slips off the upper surface of a spring-loaded arm 15.

The forward end of the arm 15 is supported by a hinge pin 16, which in turn is supported by a right (looking from the front of the toilet) main support 17. A torsional spring 18 mounted around hinge pin 16 has one leg anchored over support pin 9 and the other leg under tha arm 15, causing the thus spring-loaded arm 15 to pivot upwardly and around hinge pin 16 when its other end is free of notch 14. The spring-loaded arm 15 has a notch 19 between its support points on hinge pin 16 so as to allow the leg of spring 18 to be mounted in line with the center of the arm 15.

The right (when viewed from the front of the toilet) lid hinge 20 supports the right side of lid 1 and in turn is supported by the hinge pin 16 and pivots around it. At right angles to the lid hinge 20 and mounted on it is a closer pin 21, which extends across the pivot plane of the spring-loaded arm 15. When the lid 1 is raised to a position behind the vertical, the closer pin 21 rests upon the upper surface of the spring-loaded arm 15 so that the upward pivot of the arm 15 bearing against the closer pin 21 forces the lid 1 to a position forward of the vertical and toward the closed position.

As the lid 1 pivots toward closing, its left (when viewed from the front of the toilet) lid hinge 22 also pivots around its hinge pin 23. Hinge pin 23 is supported by a left (looking from the front of the toilet) main support 24. The left lid hinge 22 is fitted with gear teeth 25 that mesh with teeth in a pinion gear 26 located to the rear of the left lid hinge 22 and supported by pinion shaft 27. The pinion shaft 27 is in turn supported by bearing surfaces in both the left main support 24 and the left dash-pot assembly 28.

The seat 2 is also supported by left and right hinges, namely 39 and 38, respectively (when viewed from the front of the toilet), and in turn respective hinge pins 23 and 16. The right seat hinge 38 is also fitted with gear teeth 25 that mesh with a pinion gear 26 similar to the left lid hinge 22.

Turning now to FIG. 3, it shows the right lid and seat hinges 20 and 38 and right dash-pot 28 for the seat 2 in greater clarity. However, both dash-pot assemblies 28 are identical, so in describing the right (seat 2) dash-pot 28 all positions and numbers also apply to the left (lid 1) dash-pot 28, namely hinge teeth 25, pinion gear 26, pinion shaft 27 and all dash-pot parts 29 through 34.

The dash-pot assembly 28 consists of a body 29, and cover 30, a vane 31 and a check valve 32. The vane 31 is keyed to the pinion shaft 27 and rotates with it. The shaft 27 passes through the vane and is supported at bearing surfaces in both sides of the body 29. As the left lid hinge 22 (or right seat hinge 38) pivots, the hinge teeth 25 rotate the pinion gear 26 and by a hinge gear teeth to pinion gear teeth ratio of 2 to 1 the 90 degree closing cycle of the lid 1 (or seat 2) imparts a 180 degree rotation to the pinion gear 26, pinion shaft 27 and vane 31.

The interior of body 29 is shaped so as to afford a close tolerance between it and the rotating vane 31, and by filling the body 29 with a viscous fluid, the resultant resistance imparted to the vane 31 by the slow passage of fluid passing the vane 31 slows the entire system and keeps the lid 1 (or seat 2) from slamming. Hence, the dash-pots and associated gears act as gravity restraining means for gradually lowering the toilet lid or lid and seat to the closed position.

The vane 31 has an open hole 33 over which is fitted the check valve 32. The check valve 32 fits flush against the vane 31 sealing the hole 33 during the closing cycle due to fluid pressure thereon. The check valve 32 is held away from the hole 33 by the fluid pressure on its underside during the opening cycle, thereby offering little fluid resistance to the vane 31 and in turn lid 1 (or seat 2). Feet 34 provide for sufficient clearance between vane 31 and valve 32 during the opening cycle.

By providing the under side of the cover 30 with a channel 35, fluid can be by-passed around vane 31 and by providing the channel 35 with a threaded needle valve 36, the fluid flow and in turn the speed of vane 31 is controlled. After the needle valve 36 has been turned or adjusted to the desired position, it is locked there by the lock nut 37. To prevent fluid from leaking from the body 29, gaskets are used between cover 30 and body 29 and between lock unit nut 37 and body 29. An O-ring seals and acts as a bearing surface for the pinion shaft 27 where it passes through the side of body 29.

After the expandable chamber 7 has been inflated or expanded and has initiated closing, a pressure relief valve assembly is provided so that the expanded chamber will deflate and allow the latch release and reset arm 8, trigger 11 and latch 12 to return to their normal position for a recycle of the closing operation. Thus, a tapered relief valve tube 40 is located atop the rigid tubing 6 near where it passes through the left main support 24. The tapered relief valve tube 40 has an opening 41 at its apex which is closed by one end of a rocker arm 42. Resilient material 43 on the under side of the rocker arm 42 affords a positive seal together with the force of a spring 44 holding the rocker arm 42 onto the opening 41. Rocker arm 42 is pivoted and supported by pin 45 mounted on the left main support 24. The left pinion shaft 27 passes through the left main support 24 and the forward end of the rocker arm 42 lies under the outer end of the pinion shaft 27. This end of pinion shaft 27 is cam shaped so that as it begins to turn it bears against and pivots the rocker arm 42 and opens the valve immediately after the lid 1 begins its closing cycle. Air pressure is then bled from the expanded chamber 7, tubing 5 and 6 and container 4. Since the flexible tubing 5 passes out of the tank 3 above the full water line A, water cannot flow into the tubing 5.

The spring-loaded arm 15 is automatically reset into the notch 14 of the latch 12 against the upward force of spring 18 by a cam 46 located on the right lid hinge 20 pressing on the latch release and reset arm 8 at the extension point 47 which causes the arm 8 to pivot around the support pin 9 in the direction counter to closing. This movement of the latch release and reset arm 8 causes the catch finger 10 to bear down upon the

spring-loaded arm 15 and also move it counter to closing. The cam 46 is so positioned in respect to the latch release and reset arm 8 that when the lid 1 comes to rest on its closing cycle, the catch finger 10 has pulled the upper surface of the spring-loaded arm 15 below the notch 14 on latch 12, and because of the position and weight of the trigger 11, in relation to latch pin 13, gravity pivots the latch 12 forward so that notch 14 is positioned to secure the spring-loaded arm 15 from pivoting when the lid 1 is again raised.

Notwithstanding the above, if the lid 1 were intercepted on its closing cycle and returned to the raised position before the cam 46 was able to reset the spring-loaded arm 15, the closer pin 21 would bear down upon the arm 15 and force it back until it was secure under the notch 14. This is the procedure that would be used whenever a person is sitting on the seat 2 with the lid 1 raised and he were to flush the toilet. The lid 1 would gently tap him on the back and he could then push it back to secure it.

In order to prevent the spring-loaded arm 15 from pivoting further than necessary to push the lid 1 to a position forward of the vertical, where gravity then completes the closing cycle, the latch release and reset arm 8 has a heel 48 located at its forward end which butts against the toilet bowl when maximum travel has been reached, and because the catch finger 10 is part of the arm 8 and is above the arm 15, the arm 15 is thereby prevented from pivoting further.

The support pin 9 runs through the entire bowl portion of the closer device and supports or ties together the following components: main supports 17 and 24, both dash-pot assemblies 28, and the latch release and reset arm 8. Suitable sleeves (not shown) over pin 9 keep the various components spaced in relation to each other. The bowl portion of the closer device rests upon a thin protective cushion 49 and is attached to the toilet bowl in the conventional manner by threaded bolts (not shown or numbered) forming part of both main supports 17 and 24 at their undersides.

For applications where persons normally close the toilet lid, the embodiment or modification shown in FIG. 4 is provided. This modification allows the toilet to be automatically flushed by manually moving the lid a short distance toward closing and then have it close the rest of the way slowly and unaided. Specifically, it operates as described below.

In FIG. 4, showing left main support 24, pinion shaft 27 is extended past rocker arm 42 so as to clear relief valve tube 40. Another cam, end cam 52, is positioned at the extreme end of pinion shaft 27 and provided with cam surfaces 53 and 54. Under pinion shaft 27 there is a slotted arm 55, supported and pivoted from pin 9. Mounted inside the slotted portion of arm 55 is pawl 56, supported and pivoted by pin 57. Pawl 56 is pivotable to the rear but is prevented from pivoting forward by projection 58 on arm 55. At the free end of arm 55, link 59 is provided to connect to flushing arm 60. Flushing arm 60 is supported and pivoted by pin 61 in slot 62 at the rear of left main support 24. The free end of flushing arm 60 is provided with flushing rod 63 which is in turn connected to the conventional toilet tank flushing handle 64.

In operation, when the toilet lid 1 is manually moved forward past the vertical on its closing cycle, the lid hinge gear teeth 25 on the left lid hinge 22 meshing with pinion gear 26, rotate pinion shaft 27 and end cam 52. This causes cam surface 53 to bear against pawl 56, and because pawl 56 cannot pivot forward, arm 55 pivots downwardly and pulls link 59, flushing arm 60, flushing rod 63 and flush handle 64, thus flushing the toilet. Since the end cam 52 has a shorter pivot radius than arm 55, continued rotation of end cam 52 causes a loss of contact between cam surface 53 and pawl 56. However, pawl 56 cannot return to its normal position because of interference with cam surface 54. This interference is alleviated with further rotation of end cam 52. This short interference interval is provided because some toilet flush handles must be held momentarily in the flush position to assure positive flushing action. After cam surface 54 has rotated past pawl 56, arm 55, flushing arm 60, flushing rod 63 and flush handle 64 return to their normal position.

When the lid 1 is again raised, end cam 52 rotating in the reverse direction causes cam surface 54 to bear against pawl 56 and pivot it to the rear, which allows cam surface 53 to return to its raised position above pawl 56. Spring 65 provides positive return of pawl 56 thereby placing it in position for the next closing cycle. Since pinion shaft 27 is subjected to the slowing action of a dash-pot 28, the lid is prevented from slamming during its free fall after flushing has been initiated.

It will be appreciated that various modifications and changes can be made in the closer device of the invention by those skilled in the art without departing from the essence of the invention and that accordingly the invention is to be limited only within the scope of the appended claims.

What is claimed is:

1. A toilet lid or lid and seat closer device for tank-type toilets comprising an open-bottomed cylinder locatable within a toilet flush tank with the open bottom slightly above the low water level and connected by tubing to a pneumatic-ally expandable chamber within a housing locatable atop the rear of a toilet bowl and gravity restraining means for gradually lowering the toilet lid or lid and seat to the closed position.

2. The closer device as defined by claim 1 wherein said gravity restraining means comprises two sets of dash-pots and associated gears operatively and separately connected to the lid and to the seat and within the housing locatable atop the rear of the toilet bowl.

3. The closer device as defined by claim 1 wherein said pneumatically expandable chamber is operatively associated with a pivotable latch release and reset arm which engages a latch for a pivotable spring-loaded arm in engagement with a pivotable hinge for the toilet lid.

4. The closer device as defined by claim 1 wherein said tubing has a pressure relief valve assembly for deflating the pneumatically expandable chamber after the lid begins lowering comprising a relief valve tube openable by disengagement therewith of a rocker arm which is cam actuated by rotation of a pinion shaft for a pinion gear meshing with a lid gear hinge.

5. The closer device as defined by claim 2 wherein each dash-pot has a channeled cover with an adjustable threaded needle valve in the channel for controlling viscous fluid flow within the dash-pot and the speed of a vane therein keyed to a rotatable pinion shaft for a pinion gear meshing with either a lid or seat gear hinge.

6. The closer device as defined by claim 2 which further comprises means for flushing the toilet actuated by forward movement past the vertical of a raised toilet lid.

7. The closer device as defined by claim 3 wherein said pivotable hinge for the toilet lid has a cam which presses against the pivotable latch release and reset arm during the final stages of lid closing and thereby resets the latch and the pivotable spring-loaded arm in interengagement so as to preclude raising the lid against the force of a spring for the pivotable spring-loaded arm.

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