ABSTRACT

The mechanism is a powered toilet seat lift that attaches to the side lip of a toilet and lifts the seat without modification to the toilet or seat. It consists of an attachment bracket, a linear actuator, a battery, and a remote control transmitter. An alternative to the linear actuator is a rotary actuator that pushes up the seat as it rotates from the front of the toilet to the back. An alternative to the battery is a cord connecting to the building electrical power supply.
FIG 1
FIELD OF THE INVENTION

This invention relates to toilet appliances that raise and lower toilet seats.

BACKGROUND

Toilet seats are easily contaminated during use. Contamination is reduced when seats are lifted during standing urination. However, because of biological contamination on the seats, many users are reluctant to touch the seat to raise it—instead, they leave the seat down during standing urination which further contaminates the seat. If one user chooses to lift the seat, the next user must touch the seat to lower it to a sitting position.

The field of toilet seat lifts contains a wide range of lifts that use a variety of mechanical and powered means to lift the seat. Prior devices for raising and lowering toilets seats can be grouped into several categories. The first category includes simple handles that attach to the toilet seat and are lifted by the user to raise the seat instead of touching the seat itself. The drawback to these devices is that user must lift and lower the seat—possibly contaminating their hands.

A second category of lifts includes a wide array of foot-actuated mechanical lifts. These lifts often require modifications to the toilet and sometimes require the user to keep their foot on a pedal during urination.

A third category of toilet seat lifts includes hydraulic lifts, using pressure from the toilet tank water to lift the seat. These lifts require modifications to the toilet tank or tank cover to accommodate the hydraulic tubing. In addition, the tubing can be unsightly and difficult to clean.

A forth category of toilet seat lifts includes pneumatic lifts. Lin in U.S. Pat. No. 5,029,347 (2003) shows one variation of a pneumatic lift using a lip-attached bellows mechanism with a bellows foot pedal to raise the seat. This is similar to the foot-actuated mechanical lifts and requires the user to maintain pressure on the foot bellows to keep the seat in the upright position. The lift also has tubing from the pedal to the lifting device that will be difficult to clean.

The last category includes motorized lifting devices. This category includes cable-driven motorized lifts, hinge-mounted lifts, and linear actuator lifts. Ward in U.S. Pat. No. 5,311,619 (1994) shows one example of a cable-driven lift. The lifting motorized device is attached to the wall and attached to the seat with cables to pull the seat to a raised position. The long cables are unsightly and will be difficult to clean. Mounting the lift motor to the wall can also compromise the integrity of normal bathroom sheetrock if not installed to firm structure.

Avila in U.S. Pat. No. 6,539,557 (2003) shows one example of a hinge-mounted lift. A motor with a drive assembly is attached to the toilet seat hinge mechanism to raise and lower the seat. This type of motorized lift requires modifications to the toilet seat hinge mechanism or requires the user to purchase a new seat with the hinge mechanism already installed. Mohammed in U.S. Pat. No. 6,915,532 (2005) attempted to overcome this problem by proposing a similar device that mounts behind the hinge instead of to the hinge itself. This presents new mounting difficulties, as the device must either be bonded or fastened to the toilet itself in some semi-permanent fashion.

Mohammed in U.S. Pat. No. 6,915,532 (2005) also showed two more embodiments that are examples of motorized linear actuator lifts. These devices, while similar to the proposed design, are floor mounted and must be adjusted for toilets of different heights. The shown embodiments also require the fastening of a pivot pin to the seat. The vertical rod and stabilizer rod of the first linear actuator embodiment and the exposed rack of the second embodiment will make these devices difficult to clean. The power cord attached to the building power supply will possibly require long, unsightly cords or might require a new electrical wall connection (many bathrooms do not have an electrical wall outlet close to the toilet).

BRIEF SUMMARY OF THE INVENTION

The proposed design is a device for raising and lowering a standard toilet seat without touching the seat or the area near the seat with the hands. It is compatible with and attaches to standard toilets without requiring modifications to the toilet or toilet seat. It is easy to install, as it only clamps onto the lip of the toilet. It is removable from the toilet for ease of cleaning. It has an enclosed design and smooth external surface that allows for ease of cleaning and prevents contaminants from entering. The seat is left in the raised position, a timer automatically closes the toilet seat after a set amount of time and thus prevents the common complaint that someone has left the seat up.

The mechanism consists of an attachment bracket, a linear actuator, a battery, a motor controller, and a remote switch. The attachment bracket has two tabs that hook over the side lip of the toilet and attachment knobs that press against the toilet and create a firm clamp. The linear actuator is attached to the attachment bracket and has a push rod driven by an electric motor that pushes up on the seat. Power is provided to the motor by a rechargeable battery. The battery is inserted into the actuator housing during use but can easily be removed for recharging.
A remote control transmitter with an up/down switch sends signals to a receiver in the motor controller circuit to raise or lower the seat. Limit switches indicate end-of-travel and stop the motor. If the seat is left in the raised position, the motor controller circuit has a timer to automatically lower the seat after a pre-set amount of time.

An alternative to the linear actuator is a rotary actuator that pushes up the seat as it rotates from the front to the back of the toilet.

An alternative to the attached battery is for the motor to be powered from a standard wall outlet using an AC to DC transformer or for the motor controller to be attached directly to the building power supply.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 shows an isometric view of the toilet seat lift attached to the toilet with the seat in the raised position.

FIG. 2 shows a close up isometric view of the toilet seat lift.

FIG. 3 shows an isometric view of the inside mechanisms of the toilet seat lift.

FIG. 4 shows a close up isometric view of the toilet seat motor, gears, and lead screw.

FIG. 5 shows an isometric view of the remote control transmitter.

FIG. 6 shows an isometric view of the inside mechanisms of the remote control transmitter.

FIG. 7 shows an isometric view of a second embodiment of the toilet seat lift attached to the toilet with the seat in the raised position.

FIG. 8 shows an isometric view of the second embodiment of the device.

FIG. 9 shows an isometric view of the inside mechanisms of the second embodiment of the device.

FIG. 10 shows an isometric exploded view of the second embodiment of the device.

DRAWING KEY

1. Toilet
2. Toilet Seat
3. Lip Attachment Bracket Assembly
4. Linear Actuator Assembly
5. Rechargeable Battery Pack
6. Remote Control Transmitter Assembly
7. Lip Attachment Bracket
8. Lip Attachment Knobs
9. Back Linear Actuator Housing
10. Front Linear Actuator Housing
11. Battery Attachment Housing
12. Straight Push Rod
13. Seat Push Rod
14. Lead Screw Nut
15. Lead Screw
16. DC Motor
17. Motor Spur Gear
18. Middle Spur Gear
19. Lead Screw Spur Gear
20. Bottom Limit Switch
21. Top Limit Switch
22. Motor Controller Circuit Board Assembly
23. Infrared Receiver Module
24. Front Transmitter Housing
25. Back Transmitter Housing
26. Transmitter Up/Down Switch
27. Switch Axle
28. Transmitter Circuit Board Assembly
29. Infrared LED
30. 9v Battery
31. Rotary Actuator Assembly
32. Rotary Actuator Housing
33. Rotary Actuator Cover
34. Rotary Lift Rod
35. Roller
36. Large Worm Gear
37. Small Worm Gear
38. Worm Shaft
39. Bushing, Small
40. Bushing, Large
41. Spacer

DETAILED DESCRIPTION OF THE INVENTION

FIGS. 1 through 6 show the preferred embodiment of the toilet seat lift. FIG. 1 shows the major components of the design. A Lip Attachment Bracket Assembly 3 attaches to the lip of a Toilet 1. A Linear Actuator Assembly 4 attaches to the Lip Attachment Bracket Assembly 3 and raises and lowers a Toilet Seat 2. A Rechargeable Battery Pack 5 provides power to the Linear Actuator Assembly 4. The Linear Actuator Assembly 4 is controlled by a Remote Control Transmitter Assembly 6.

FIG. 2 shows a close-up of the toilet seat lift. A Lip Attachment Bracket 7 fits over the side lip of the Toilet 1. Threaded Lip Attachment Knobs 8 tighten against the Toilet 1 and clamp the Lip Bracket 7 to the Toilet 1.

A Back Linear Actuator Housing 9 attaches to the Lip Bracket 7 with screws (not shown). A Front Linear Actuator Housing 10 attaches to the Back Actuator Housing 9 with screws (not shown). A Battery Attachment Housing 11 attaches to the Front Actuator Housing 10 with screws.
A Seat Push Rod 13 fits between the Toilet Seat 2 and the Toilet 1 and is bonded to a Straight Push Rod 12. When the Linear Actuator Assembly 4 is commanded to go UP, the Straight Rod 12 is extended and the Seat Rod 13 pushes against the underside of the Toilet Seat 2 and raises the seat. When the Linear Actuator Assembly 4 is commanded to go DOWN, the Straight Rod 12 is retracted and the Toilet Seat 2 follows the Seat Rod 13 back to the sitting position.

FIG. 3 shows the inside mechanisms of the toilet seat lift. A Lead Screw Nut 14 is bonded to the Straight Rod 12. A reversible DC Motor 16 sits in the Back Actuator Housing 9 and is bonded to a Motor Spur Gear 17. The Motor Gear 17 turns a Middle Spur Gear 18 which turns a Lead Screw Spur Gear 19. The Lead Screw Gear 19 has flats that engage with flats on a Lead Screw 15 and turns the Lead Screw 15 when the Motor 16 is activated. The Lead Screw Nut 14 rides up and down in the Back Actuator Housing 9 when the Lead Screw 15 is actuated.

An Infrared Receiver Module 23 is part of a Motor Controller Circuit Board Assembly 22. The Motor Controller 22 receives power from the Battery Pack 5. The Receiver Module 23 waits for a signal from the Transmitter Assembly 6.

When the Toilet Seat 2 is in the DOWN position, the Motor Controller 22 will accept only an UP command. Upon receiving an UP command, the Motor Controller 22 will provide power to the Motor 16 to rotate such that the Lead Screw 15 drives the Lead Screw Nut 14 upward. The Motor 16 will continue to turn until the Lead Screw Nut 14 reaches the top and activates a Top Limit Switch 21. The Top Limit Switch will signal the Motor Controller 22 to shut off the Motor 16 and start the TIMING MODE.

When the Toilet Seat 2 is in the UP position and the Top Limit Switch 21 is activated, the Motor Controller 22 goes into a TIMING MODE and starts a timer. If the Receiver Module 23 receives an UP command during the TIMING MODE, the Motor Controller 22 will ignore the command. If the Receiver Module 23 receives a DOWN command during the TIMING MODE, the Motor Controller 22 will cancel the timing device and activate the Motor 16 to go down until a Bottom Limit Switch 20 is activated. If the timer runs out before Motor Controller 22 receives a DOWN command, the Motor Controller 22 will command the Motor 16 to go down until the Bottom Limit Switch 20 is activated. Once the Bottom Limit Switch 20 is activated, the Motor 16 will shut off and the Motor Controller 22 will go into a SLEEP MODE waiting for another UP command.

If the Motor 16 is in the process of raising the Toilet Seat 2 and the Receiver Module 23 receives a DOWN command, the Motor Controller 22 will cancel the UP command and command the Motor 16 to go down. When the Motor 16 is in the process of lowering the Toilet Seat 2 and the Receiver Module 23 receives a UP command, the Motor Controller 22 will cancel the DOWN command and command the Motor 16 to go up. Motor 16 motion is only stopped at the Top Limit Switch 21 and Bottom Limit Switch 20.

FIG. 4 shows a close-up of the Motor 16, gears, and Lead Screw 15.

FIG. 5 shows a close-up of the Remote Control Transmitter Assembly 6. The transmitter housing consists of a Back Transmitter Housing 24 and a Front Transmitter Housing 25. A Transmitter Up/Down Switch 20 is pressed by the user to command the toilet seat lift to raise or lower the Toilet Seat 2.

FIG. 6 shows the inside mechanisms of the Remote Control Transmitter Assembly 6. A Switch Axle 27 runs through the Up/Down Switch 26 and allows it to rock back and forth. When the Up/Down Switch 26 is pressed, the back of the Up/Down Switch 26 presses into PCB mounted switches (not shown) on a Transmitter Circuit Board Assembly 28. If the UP switch is pressed, the Transmitter Circuit 28 sends an infrared signal through an Infrared LED 29 to the Receiver Module 23 commanding the Motor controller 22 to raise the Toilet Seat 2. If the DOWN switch is pressed, the Transmitter Circuit 28 sends an infrared signal through the Infrared LED 29 to the Receiver Module 23 commanding the Motor Controller 22 to lower the Toilet Seat 2. A 9 V Battery 30 provides power for the Transmitter Circuit 28 and the Infrared LED 29.

FIG. 7 shows a second embodiment of the design. The Linear Actuator Assembly 4 is replaced with a Rotary Actuator Assembly 31. The Lip Attachment Bracket Assembly 3 and the Rechargeable Battery Pack 5 remain the same as for the Linear Actuator Assembly 4.

FIG. 8 shows a close-up of the rotary toilet seat lift. The Lip Attachment Bracket Assembly 3 attaches to the side lip of the Toilet 1. A Rotary Actuator Housing 32 attaches to the Lip Bracket Assembly 3 with screws (not shown). A Rotary Actuator Cover 33 attaches to the Rotary Actuator Housing 32 with screws (not shown). A Roller 35 fits between the Toilet Seat 2 and the Toilet 1 and is attached to a Rotary Lift Rod 34 such that it can roll but will not come off. When the Rotary Actuator Assembly 31 receives an UP command, the Rotary Lift Rod 34 is rotated from the front of the Toilet 1 to the back of the Toilet 1. When the Rotary Actuator Assembly 31 receives a DOWN command, the Rotary Lift Rod 34 is rotated back to the sitting position. Limit switches (not shown) signal the end of travel and shut off the Motor 16.

FIG. 9 shows the major internal mechanisms of the Rotary Actuator Assembly 31. The Rotary Lift Rod 34 passes through the Rotary Actuator Cover 33, a Large Worm Gear 36, and the Rotary Actuator Housing 32. The Motor 16, which is the same motor used for the linear actuator, fits in the Rotary Actuator Housing 32 and is bonded to a Worm Gear Shaft 38. The Worm Gear Shaft 38 is bonded to a Small Worm Gear 37 and drives the Large Worm Gear 36 and the Rotary Lift Rod 34 to raise and lower the Toilet Seat 2. Two Small Bushings 39 (only one visible) fit over the Worm Gear Shaft 38 to react loads from the Small Worm Gear 37 to the Rotary Actuator Housing 32 with minimal friction.

FIG. 10 shows an exploded view of the Rotary Actuator Assembly 31 internal components. Two Large Bushings 40 fit over the Rotary Lift Rod 34 to transfer loads from the Toilet Seat 2 to the Rotary Actuator Housing 32 with minimal friction. Two Spacers 41 keep the Large Worm Gear 36 centered with the Small Worm Gear 37 and transfer axial loads to the Large Bushings 40.
1. A toilet seat lift comprising:

an attachment bracket that mounts to the side lip of a toilet,

an electric linear actuator attached to said attachment bracket,

a push rod attached to said linear actuator and fitting between said toilet and a hinged toilet seat,

a control circuit to control said linear actuator,

a remote control transmitter with a switch to activate said control circuit, and

a rechargeable battery pack attached to said linear actuator to provide power.

2. The combination according to claim 1 wherein said linear actuator is replaced by a rotary actuator.

3. The combination according to claim 1 wherein said battery is replaced by a cord connecting to the building electrical power supply.

4. The combination according to claim 2 wherein said battery is replaced by a cord connecting to the building electrical power supply.

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