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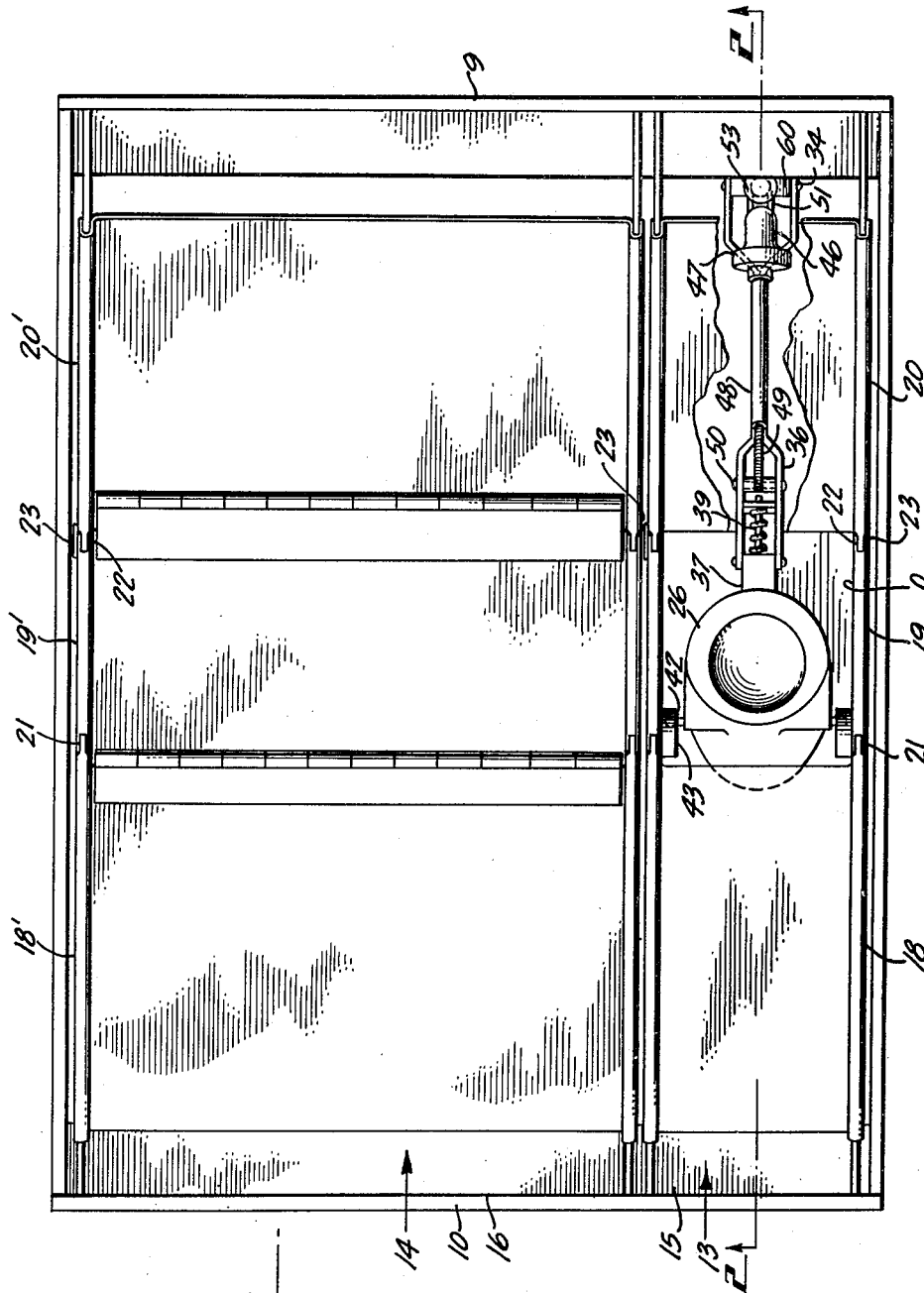


Fig. 1

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March 14, 1950

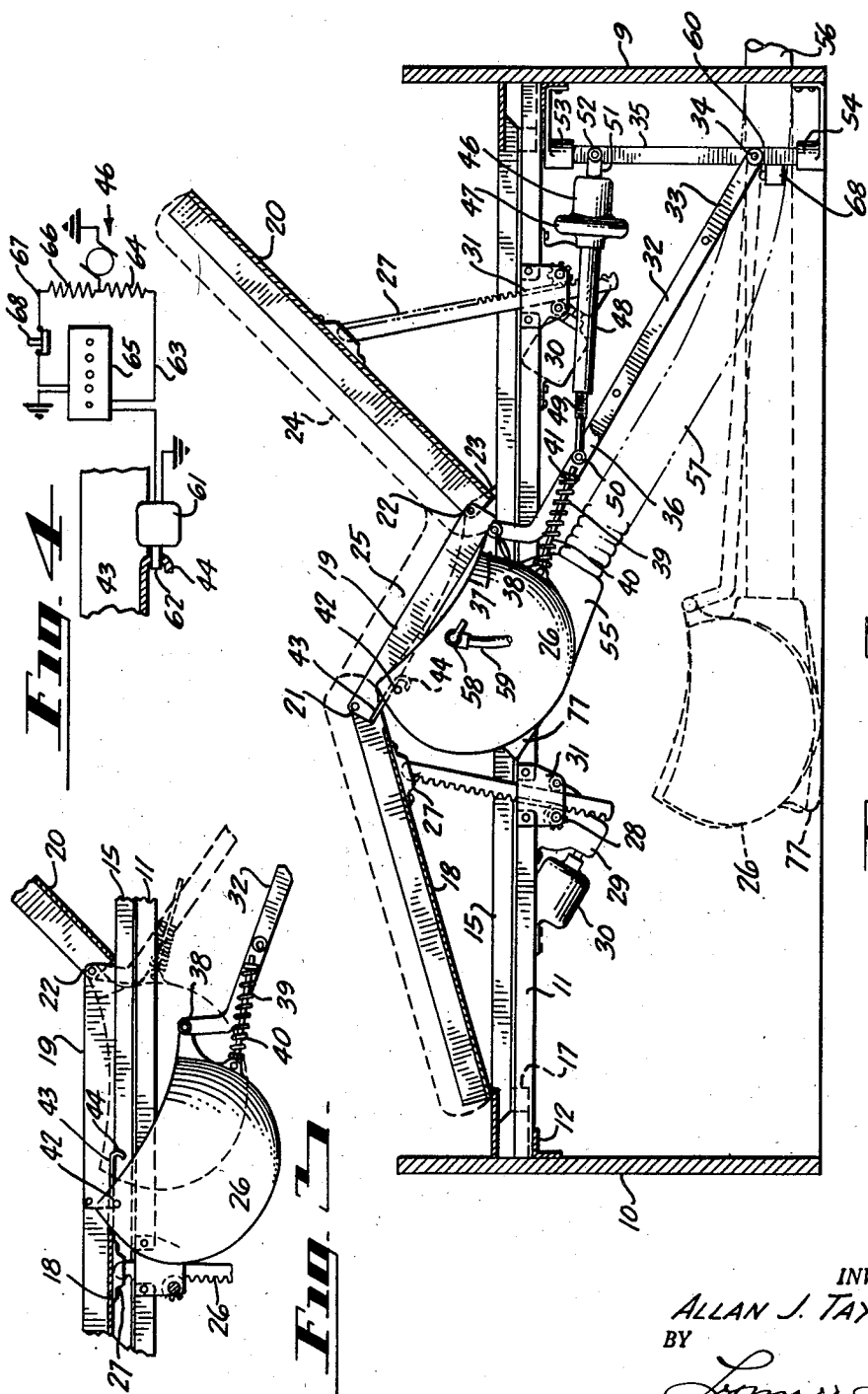
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INVALID'S BED

Filed July 30, 1945

3 Sheets-Sheet 2



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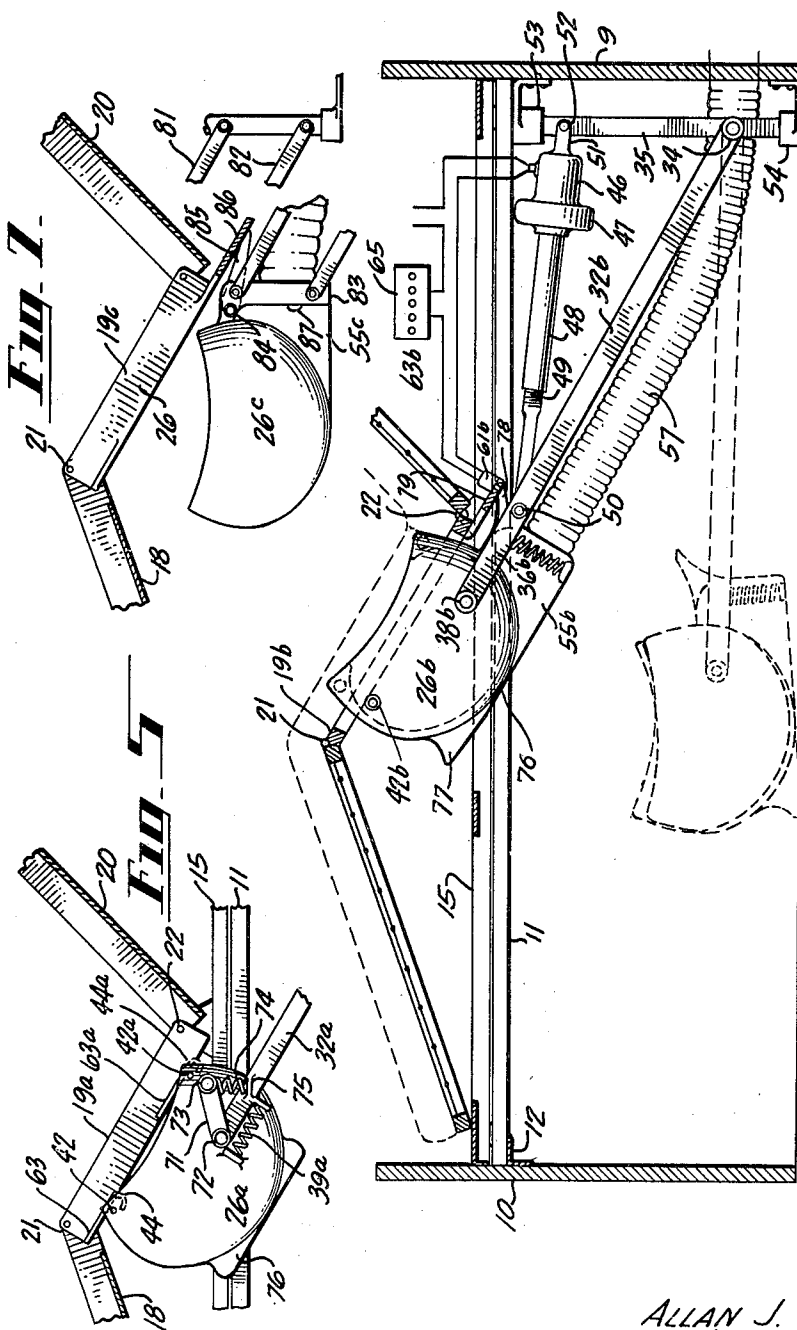
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INVALID'S BED

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3 Sheets-Sheet 3



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2,500,741

INVALID'S BED

Allan J. Taylor, Los Angeles, Calif., assignor, by direct and mesne assignments, of one-half to Marvel Beem, West Los Angeles; and one-half to The Beem Foundation, Los Angeles, Calif., a charitable trust of California.

Application July 30, 1945, Serial No. 607,847

14 Claims. (Cl. 5—90)

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This invention relates to invalid beds, and has as its general object to provide a bed having a flushable toilet incorporated therein, eliminating the necessity for the use of a bed pan.

One of the objects of the invention is to provide for supporting the patient in a semi-upright position sufficiently approximating the normal position in the use of a toilet, to permit a substantially normal use. More specifically, the invention aims to provide, in an invalid's bed, a flushable toilet arrangement in which the toilet bowl, in its operative position, is so inclined as to permit the body of the patient to be supported in a proper relation to the bowl and in a comfortable reclining position. In the conventional use of a bed pan, supported in a horizontal position, and with the patient supported in a reclining position, there is a tendency for the body of the patient to slide forwardly on the pan. The invention eliminates this difficulty by providing for the elevation of a thigh section of a sectional bed to an inclined position, and bringing the toilet bowl to a corresponding position so that the patient may be supported between the thigh portion and an inclined back section of the bed, with the toilet bowl in proper position for use.

In order that the bowl may be brought to a proper operative position with relation to a patient supported upon the bed, the invention provides for presenting the bowl through an opening in the bed. It is of course desirable that the bowl be removed to an inoperative position when not in use, and it is also desirable that it be concealed in the inoperative position. Consequently, a further object to the invention is to provide for the concealing of the bowl beneath the bed when it is not in use, and for raising the bowl when it is to be used.

Another object of the invention is to provide for tilting the bowl from a normally horizontal position to a position conforming to the inclination of the thigh section of the bed. To this end, the invention contemplates hinging the bowl upon the elevating mechanism, and utilizing the contact of the bowl with the thigh section to cause the bowl to assume the angular position of the thigh section.

Another object of the invention is to provide for swinging the bowl horizontally from beneath the bed in order to permit of its being used by an ambulatory patient. In connection with this general object, the invention aims to provide a bowl operating mechanism that is adapted to swing the bowl freely and relatively noiselessly in a horizontal direction. To obtain this object, the bowl is

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suspended by the elevating mechanism, for swinging movement about a vertical pivot and in a position just clearing the surface of the floor.

Another object is to provide an invalid's bed which, in addition to the above-mentioned features, provides for supporting the weight of the patient upon the bowl without imposing all of such weight upon the elevating mechanism. Toward the attainment of this general object, one of the specific objects of the invention is to provide means for latching the bowl to the thigh section when the bowl completes its elevating movement. The invention also aims to effect this latching automatically as the result of elevating movement. In addition, the invention contemplates that the bowl may be latched to the thigh section of the bed in any position of angularity of the thigh section, even though the bowl is elevated about a hinge axis which is considerably removed from the hinge axis of the thigh section.

In order to relieve the elevating mechanism of at least a substantial portion of the weight of the patient when the bowl is being used in the lowered and laterally projected position, the invention provides a yielding connection between the bowl suspension mechanism and the bowl itself, which permits the bowl to move downwardly under the weight of the patient until it rests against the floor. When the weight of the patient is removed from the bowl, the bowl is tilted upwardly by this yielding connection and is thereby supported out of contact with the floor in order that it may be swung horizontally without contacting the floor.

The yielding connection between the bowl and the suspension mechanism serves the additional object of maintaining the bowl normally in a position of maximum up-tilt so that the outer end of the bowl will always contact the thigh section before the inner end of the bowl makes contact. The continued upward movement of the inner end of the bowl is then utilized to shift the bowl longitudinally with reference to the thigh section of the bed so as to effect the latching of the bowl to the thigh section.

Another object of the invention is to provide a bowl operating mechanism adapted to automatically terminate the elevating movement of the bowl by de-energizing the power means when the bowl has become latched to or properly positioned with reference to the thigh section.

Other objects of the invention will appear in the following specification when considered in connection with the appended drawings, where-
in:

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Fig. 1 is a plan view of an invalid's bed embodying the invention, a portion of the bowl seat back rest being broken away to illustrate the bowl elevating mechanism therebeneath;

Fig. 2 is a longitudinal sectional view of the bed taken on the line 2—2 of Fig. 1;

Fig. 3 is a partial longitudinal sectional view showing the bed mechanism in a position different from that of Fig. 2;

Fig. 4 is a detailed sectional view showing the limits switch for the elevating mechanism.

Fig. 5 is a partial sectional view of a modification of the invention;

Fig. 6 is a longitudinal sectional view of a further modified form of the invention; and

Fig. 7 is a fractional sectional view showing an intermediate stage of elevating movement of the bowl.

As an example of one form in which the invention may be embodied, I have shown in Figs. 1-3 inclusive an invalid's bed including a head 9, a foot 10, fixed longitudinal rails 11 secured to the head and foot as at 12, a toilet seat bed bottom section, indicated generally at 13, a removable bed bottom section, indicated generally at 14, and subframes 15 and 16 upon which the toilet seat section 13 and removable bed bottom section 14 are supported. The subframe 15 is secured to the rails 11 as indicated at 17, and the subframe 16 is mounted in any suitable manner (as, for example, upon rollers) so that it may be shifted laterally and removed from the bed and onto an ambulatory cart.

The toilet seat section 13 includes a leg portion 18, a thigh portion 19 having an opening, and a back rest 20. The removable bed bottom section 14 includes a leg portion 18', a thigh portion 19', and a back rest portion 20'. The leg portions 18 and 18' are hinged to the thigh portions 19 and 19' by hinges 21, and the thigh portions 19 and 19' are hinged to the back rests 20 and 20' by hinges 22. The hinges 22 are hinged to brackets 23 carried by the subframes 13 and 14 respectively. Consequently, the hinge axis joining the thigh section and back rests is a fixed axis, while the hinged axis joining the leg sections and thigh sections is adapted to move upwardly and towards the thigh sections so that the bed sections may assume the position shown in Fig. 4 or any intermediate position of elevation.

The bed bottom sections are generally of shallow construction, as shown, and are adapted to receive mattresses, the toilet seat mattress being indicated in broken lines at 24 in Fig. 3, and being provided with an opening 25 adapted to register with the opening O in the thigh portion of the toilet seat section, in order to provide access to the toilet bowl 26.

The foot and head rests 18, 18' and 20, 20' are adapted to be elevated by lifts each including a rack 27, the upper end of which is adapted to engage in a socket secured to a respective bed bottom section, a pinion 28 meshing with the rack 27, a reduction gear 29 for transmitting drive from a motor 30 to the pinion 28, and suitable guide brackets 31, in which the rack 27 is vertically slidable from a retracted position in which its upper end is below the plane of the subframes 15 and 16 to a position in which the respective bed bottom section is moved to the desired elevation.

The retraction of the racks 27 below the plane of the subframes permits the removable bed bottom section to be shifted horizontally without interference from the racks.

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The bowl 26 is carried by bowl suspension mechanism including an arm 32, having at one end a fork 33 hinged at 34 to a vertical shaft 35, and having at its other end a fork 36 in which a tail portion 37 of the bowl is pivoted as at 38. A compression spring 39, supported upon a guide rod 40, is engaged between the bowl and a cross bar 41 in the fork 36. The spring 39 yieldingly maintains the bowl in a position of maximum uptilt with reference to the arm 32. From this position of maximum uptilt, the bowl may yield downwardly, its outer end swinging downwardly about the hinge 38.

Projecting from the respective sides of the bowl 26, on an axis intersecting the forward, upper extremity of the bowl, are a pair of latch pins 42. The pins 42 are adapted to engage the underside of the thigh portion 19 of the toilet seat, as the bowl 26 is elevated. Engagement is against a pair of inwardly projecting flange members 43 each having at its rear end a latch hook 44 (see Fig. 4). The pins 42 are adapted to be drawn into the hooks 44 as the bowl 26 reaches an operative position in the opening O, thus to latch the bowl to the thigh section 19, so that a substantial portion of the weight of the patient is transmitted directly to the thigh section and the elevating mechanism is relieved of this portion of the patient's weight.

The elevating mechanism comprises a servomotor device of the linear pull type such as a hydraulic strut or screw jack. For the purpose of illustration, I have shown a servomotor pull device comprising an electric motor 46 adapted to drive, through planetary reduction gearing 47, an internally threaded sleeve 48 into which is threaded a rod 49. The rod 49 is pivoted at 50 in the fork 36, and the case of the motor 46 has a bracket 51 which is pivoted at 52 upon the shaft 35.

The upper and lower ends of the shaft 35 are journaled respectively in brackets 53 and 54 secured to the head 9 of the bed.

The bowl 26 has the customary trap and outlet 55, and is connected to a sewer outlet 56 by means of a flexible tube 57. Water for flushing the bowl is injected through a flush valve 58 and a flexible hose 59 connected to the valve 58 and to a suitable water main outlet.

The shaft 35 has a loop portion 60 through which the flexible tube 57 extends. Thus the axis of the tube 57 intersects the axis of the shaft 35.

Mounted in the thigh section 19 is a limit switch 61 which has a push button 62 extending through an opening in the hook 44 of one of the flange members 43, and is adapted to be engaged by a pin 42 when the bowl 26 reaches the operative position. The switch 61 is located in the circuit 63 through which the field coil 64 of the motor 46 (which is a reversible motor) is energized. Such energization results in elevation of the bowl, and is terminated when the switch 61 is opened by the engagement of the button 62 by a pin 42. This energizing circuit may be established initially by closing a switch in a control box 65. The other field coil 66 of the motor 46 is energized through a circuit 67 which includes one of the switches of the control box 65 but does not include the limit switch 61. Consequently the fact that the circuit 63 is open does not prevent the bowl from being lowered. The lowering of the bowl is arrested when the fork 33 contacts the button of a limit switch 68 carried by the loop

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60 of the shaft 35, the limit switch 68 being in the circuit 67 as shown in Fig. 4.

In the operation of the bed mechanism shown in Figs. 1-4 inclusive, the motors 30 are first energized, through the control box 65 and suitable circuits (not shown) and the head and foot rests are raised to the desired reclining positions. At any time after the operation of the motors 30 has commenced, the field coil 64 of the motor 46 may be energized to start the bowl elevating mechanism. As the arm 32 swings upwardly, the bowl 26 will be carried thereby in a position of inclination relative to the arm 32 which is shown in full lines in Figs. 2 and 3.

In some cases it may be undesirable for the patient to bend his knees, and in such a case, the leg and thigh sections of the toilet seat may be allowed to remain in the horizontal position as shown in Fig. 3, while the back rest 20 is raised. With the thigh section 19 in this position, the pins 42 will contact the flange members 43 at the extreme end of the thigh section, as indicated in the full line position of the bowl in Fig. 3. The hinge 38 will then be located considerably below the level of the thigh section, and the continued upward movement of the arm 32 will move the hinge 38 upwardly until it becomes substantially coaxial with the hinge 22 between the thigh section and the back rest 20. The bowl will then be in a position shown in dotted line in Fig. 3, which is in the proper position for use. In moving from the position shown in full lines to the position shown in dotted lines, the bowl 26 will shift longitudinally with reference to the thigh section 19, the pins 42 sliding beneath the flanges 43 against which they are yieldingly urged by the spring 39. The spring 39 will be compressed as the bowl 26 is forced to tilt upwardly at its rear end. Toward the end of this movement, the pins 42 will enter the hooks 44 and when completely seated therein, the switch 61 will be opened, thus arresting the operation of the motor 46 and stopping the bowl movement.

The bowl will now be supported in the position as shown in dotted lines in Fig. 3, with its forward end carried by the hooks 44 and its rear end carried by the arm 32. The weight of the patient, when he rests upon the bowl, will therefore be distributed between the latch hooks 44 and the pin 38.

In the event the leg and thigh sections are raised to the positions shown in Fig. 2 (representing the maximum elevation of the leg and thigh section) the pin 42 will first contact the flanges 43 just ahead of the hooks 44 as indicated in Fig. 2. The amount of continued upward movement of the hinge 38 from its position of initial contact to the terminal position shown in dotted lines in Fig. 2, is much less than the movement illustrated in Fig. 3, but is sufficient to draw the pins 42 into the hooks 44. The terminal position of the hinge 38 is in this case, as in the other case, substantially coaxial with the hinge 22. By arranging to have the hinge 38 move to the axis of the hinges 22, it becomes possible to arrest the bowl movement when the pins 42 are just seated in the hooks 44, irrespective of the inclination of the thigh section 19 and irrespective of the fact that the arm 32 swings from a hinge axis that is considerably removed from the hinge axis 22.

In the form of the invention shown in Fig. 5, I have provided a pair of toggle links 71 hinged at 72 to the ends of the arm 32a and hinged at 73 to the bowl 26. In addition to the spring 39a

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for urging the bowl 26 to a position of maximum up tilt with reference to the arm 32a, I employ a pair of springs 74 which are engaged between the pivots 73 and abutments 75 on the lever 32a, and which resist hinging movement of the links 71 toward the arm 32a. The springs 74 are of greater resistance than the springs 39a. Consequently, the springs 74 will not yield until the springs 39a have yielded as much as they are permitted to yield.

The bowl 26 carries a pair of pins 42a in addition to the pins 42, the pins 42a being located near the rear end of the bowl. The springs 39a, when the bowl is out of contact with the thigh section 19a, will maintain the bowl in an up tilted position with reference to the arm 32a which position is approximately as shown in Fig. 5. Consequently, in any position of the thigh section 19a below the position of maximum elevation shown in Fig. 5, the pins 42 will contact the flange members 63 before the pins 42a will contact the flange members 63a. As the arm 32a continues to move upwardly, the springs 39a will yield until the pins 42a contact the flange members 63a. Further upward movement of the arm 32a will result in jack knifing of the links 71 with reference to the arm 32a, compressing the springs 74. At the same time, because of the angular position of the link 71, the pivot 73 will move rearwardly with reference to the arms 32a as they are forced toward it. This will cause the bowl 26 to be shifted bodily rearwardly, moving the pins 42 and 42a into the hooks 44 and 44a. This form of the invention has the advantage of giving a greater amount of longitudinal movement of the bowl, and the additional advantage of making it possible to latch the bowl to the thigh section at both ends, and thereby to completely relieve the arm 32a of the weight of the patient when the toilet is being used. It has the further advantage of avoiding the necessity for bringing the hinge between the arm 32a and the bowl into coaxial relation to the hinge 22. This form of the invention has the further advantage of making it possible for both the front and rear end of the bowl 26a to shift downwardly into contact with the floor when the bowl is being used in its laterally projected position. Accordingly, the bowl 26a is provided with a flattened bottom 76 extending both forwardly and rearwardly of its central vertical axis, whereas the foot portion 77 of the bowl 26, which makes contact with the floor as the bowl 26 is tilted forwardly and downwardly, extends only on the forward side of the vertical central axis of the bowl, and the top portion 55 is inclined or spaced upwardly from the plane of the bottom of the foot portion 77, in order to permit the bowl to rock about the pivot 38 when it is near the floor.

In the form of the invention shown in Fig. 6, the bowl 26b is provided with rollers 42b adapted to ride against the undersurface of the thigh section 19b until a tail member 78 projecting from the trap 55b, makes contact with a bracket 79 which extends rearwardly from the thigh section 19b below the hinge 92. As the tail member 78 engages the bracket 79, it opens a limit switch 61b in the circuit 63b of the motor 46, thus arresting the elevation of the bowl with the tail member 78 and rollers 42b pressed upwardly against the bracket 79 and the underside of the thigh section 19b respectively. The bowl 26b will then be supported by the arm 32b through the pivot 38b. Downward movement of the forward end of the bowl under the weight of the

patient will be prevented by engagement of a tail member 78 with a bracket 79, while the rear end of the bowl will be supported by the pivots 38b.

In the form of the invention shown in Fig. 7, the bowl 26c is maintained at all times in a horizontal position by pantograph linkage including a pair of parallel arms 81 and 82 pivoted to the shaft 35, and a bracket 83 at 84, and has a tail piece 85 projecting rearwardly and adapted to engage in a bracket 86 projecting from the thigh section 19c. The weight of the bowl normally maintains it in a horizontal position in which it is supported by the engagement with the bracket 83 of a pair of lugs 87 on the trap 55c. From this horizontal position, the bowl is adapted to be tilted upwardly into operative relation to the opening 26 in the thigh section, as the result of continued elevation of the bracket 83 after the tail piece 85 has contacted the bracket 86.

I claim as my invention:

1. An invalid's bed comprising a seat frame section having an opening, a toilet bowl, means for elevating said toilet bowl from a normally inoperative lowered position beneath the bed to a position associated with said opening from below, and cooperative latching means carried by the bowl and said seat section respectively, adapted to interengage when the bowl arrives at an operative position in conjunction with said seat section, whereby to transfer at least a portion of the weight of a patient from the bowl to such seat section.

2. An invalid's bed comprising a seat frame section having a bowl receiving opening, a toilet bowl, means for elevating said bowl from a normally inoperative, lowered position beneath the bed to a position associated with said opening from below, means yieldingly acting between said bowl and said elevating means, to tilt the forward end of the bowl normally upwardly, means carried by the forward end of the bowl adapted to engage the underside of said seat section and arrest the upward movement thereof while the rear end of the bowl continues to move upwardly until the bowl is upwardly inclined with reference to the angle of inclination of said seat section, and latching means carried by the bowl and seat section respectively and adapted to interengage as a result of the aforesaid upward movement of the rear end of the bowl while the forward end is arrested, whereby to provide means for transferring at least a portion of the weight of the patient from the bowl to the seat section and to relieve said suspending and elevating mechanism of said portion of the patient's weight.

3. In an invalid's bed, a toilet bowl, suspending and elevating means upon which said bowl is carried for movement from an inoperative, lowered position beneath the bed either to a raised position cooperating with an opening in the bed or to a horizontally projected position extending laterally beyond the side of the bed for use by an ambulatory patient, means attaching the bowl to such suspending and elevating means for movement downwardly with reference thereto, means yieldingly acting between the bowl and said suspending and elevating means, the parts of said suspending and elevating means being arranged to provide a lower limit of vertical movement in which the bowl is maintained by said yielding means in a position close to but clearing the floor upon which the bed is supported, and said yielding means being tensioned to thus support the weight of the bowl itself but to yield

so as to provide for movement of the bowl downwardly from said position under the weight of a patient until the bowl rests against the floor.

4. In an invalid's bed, a mattress supporting toilet seat frame including a seat section having a bowl receiving opening, a toilet bowl, means, including an arm, for suspending and elevating said bowl from a normally lowered, inoperative position to an operative position associated with said opening from below, a link pivoted to said arm and to one end of the bowl and disposed at an angle with reference to said arm such that upward movement of the arm when the bowl is restrained from upward movement will result in longitudinal shifting of the other end of the bowl with reference to said toilet seat frame, and cooperative latching means on the bowl and said seat section respectively, adapted to interengage as the result of said longitudinal shifting movement.

5. An invalid's bed, as defined in claim 4, including spring means acting between said link and said arm to return the link to a normal inclination relative to said arm when said arm is moved downwardly.

6. An invalid's bed as defined in claim 4, including spring means acting between said arm and the bowl to yieldingly resist pivotal movement of the bowl about the axis of the pivot between said link and the bowl, and spring means acting between said link and said arm to resist jack knifing of said link and arm, the last mentioned spring means dominating said first mentioned spring means.

7. An invalid's bed as defined in claim 4, wherein said latching means comprises latching means at both forward and rear ends of the bowl, whereby the entire weight of the patient may be transferred from the bowl to said seat section.

8. An invalid's bed comprising a mattress supporting toilet seat frame having a seat section provided with a bowl receiving opening, a toilet bowl, a pantograph suspending mechanism upon which the bowl is adapted to be carried from a normally inoperative, lowered position to an operative raised position associated with said opening from below, said pantograph suspending mechanism being adapted to maintain the bowl normally horizontal throughout said movement, a horizontal pivot connecting said bowl near its rear end to said pantograph mechanism to provide for the bowl to swing upwardly, and a tail piece on said bowl projecting rearwardly from said pivot and engageable with an extension of said seat section to swing the bowl upwardly to a substantially parallel position with reference to said seat section as the bowl nears the upper limit of its elevating movement.

9. An invalid's bed comprising a mattress frame including a seat section provided with an opening, a toilet bowl, elevating mechanism for moving said bowl from a normally inoperative, lowered position beneath the bed to a position associated with said opening from below, said elevating mechanism including a yoke in which the bowl is hinged for tilting movement about a transverse horizontal axis, means yieldingly acting between the bowl and said elevating means to tilt the forward end of the bowl normally upwardly, means carried by the bowl for engaging the underside of said seat section to arrest the upward movement of the forward end of the bowl while the rearward end continues to move upwardly to a position of alignment with said seat section, and a tail piece on the bowl adapted during such upward movement of the rearward por-

tion of the bowl to engage a portion of said seat section to arrest tilting of the bowl, and a limit switch arranged to be simultaneously engaged by said tail piece for deenergizing the elevating mechanism.

10. A bed comprising an inclinable seat member having a bowl receiving opening, a toilet bowl, means for elevating said bowl from a normally inoperative, lowered position beneath the bed to a position associated with said opening from below, said bowl being pivoted to said elevating means, means yieldingly acting between said bowl and said suspending and elevating means to normally tilt the forward end of the bowl upwardly, and means carried by the forward end of the bowl adapted to engage said seat section to arrest the upward movement of said forward end of the bowl while the rear end of the bowl continues to move upwardly, whereby to cause said bowl to assume the position of inclination of said seat member upon contact therewith.

11. In a bed, a mattress supporting toilet seat frame adapted to be supported upon a floor and including a seat section having a bowl receiving opening, a toilet bowl, means for suspending and elevating said bowl from a normally inoperative, lowered position to a raised position associated with said opening from below, a vertical pivot member to which said suspending and elevating means is attached for horizontal swinging movement, to project the bowl laterally from beneath the bed for use by an ambulatory patient, means pivoting the bowl to said suspending and elevating means on a horizontal axis, said suspending and elevating mechanism including means yieldingly acting on the bowl to normally tilt the forward end of the bowl upwardly about said horizontal axis, the bowl being carried by said suspending and elevating mechanism in a position normally clearing but closely adjacent the floor, with its own weight supported by said yielding means but arranged to yield downwardly against the resistance of said yielding means under the weight of a patient, to a position resting upon the floor.

12. In an invalid's bed, a toilet seat frame section including an inclinable seat portion provided with a bowl receiving opening, a toilet bowl, an arm on one end of which said bowl is carried for elevating movement from a lowered, normally inoperative position to a position associated with said opening from below, a vertically extending pivot member on which said arm is hinged at its other end to permit vertical swinging of the arm, said pivot member being journaled beneath the bed for pivotal movement to permit the bowl to swing horizontally from beneath the bed, electrical operating means for elevating and lowering said arm, said electrical operating means including a limit switch carried by said vertical pivot member and arranged to be engaged by said arm to de-energize said electrical operating means when the bowl has reached said lowered position in its downward movement, said bowl in said

lowered position being suspended slightly above the floor so that it may be swung horizontally without contacting the floor.

13. In a bed, a toilet seat frame portion including an inclinable seat section provided with a bowl receiving opening, a toilet bowl, means on which said bowl is carried for elevating movement from a lowered, normally inoperative position to a position associated with said opening from below, a vertically extending pivot member on which said bowl carrying means is mounted for horizontal swinging movement of the bowl from beneath the bed, electrical operating means for elevating and lowering said bowl carrying means, said electrical operating means including a limit switch arranged to be actuated upon movement of said bowl carrying means to said lowered position so as to de-energize said electrical operating means when the bowl has reached said lowered position, said bowl being suspended slightly above the floor in said lowered position so that it may be swung horizontally without contacting the floor.

14. In a bed, in combination: a frame structure; a sectional bed bottom one section of which is pivotally mounted on said frame structure for elevation to an inclined seating position, said section having an opening; a toilet bowl; means mounting said toilet bowl for elevation from a lowered position beneath said opening to an operative position communicating with said opening from beneath; a drain pipe connection between said bowl and a sewer outlet; a flushing connection between said bowl and a water supply; said flushing and drain pipe connections each including relatively movable tube members and tubular means joining said tube members for such relative movement, whereby to provide for said bowl movement, said bowl being pivoted to said mounting means upon a transverse horizontal axis and arranged to make contact with said bed bottom section in a manner to assume the angle of inclination thereof when moved into said operative position.

ALLAN J. TAYLOR.

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