March 14, 1950 M. BEEM 2,500,738

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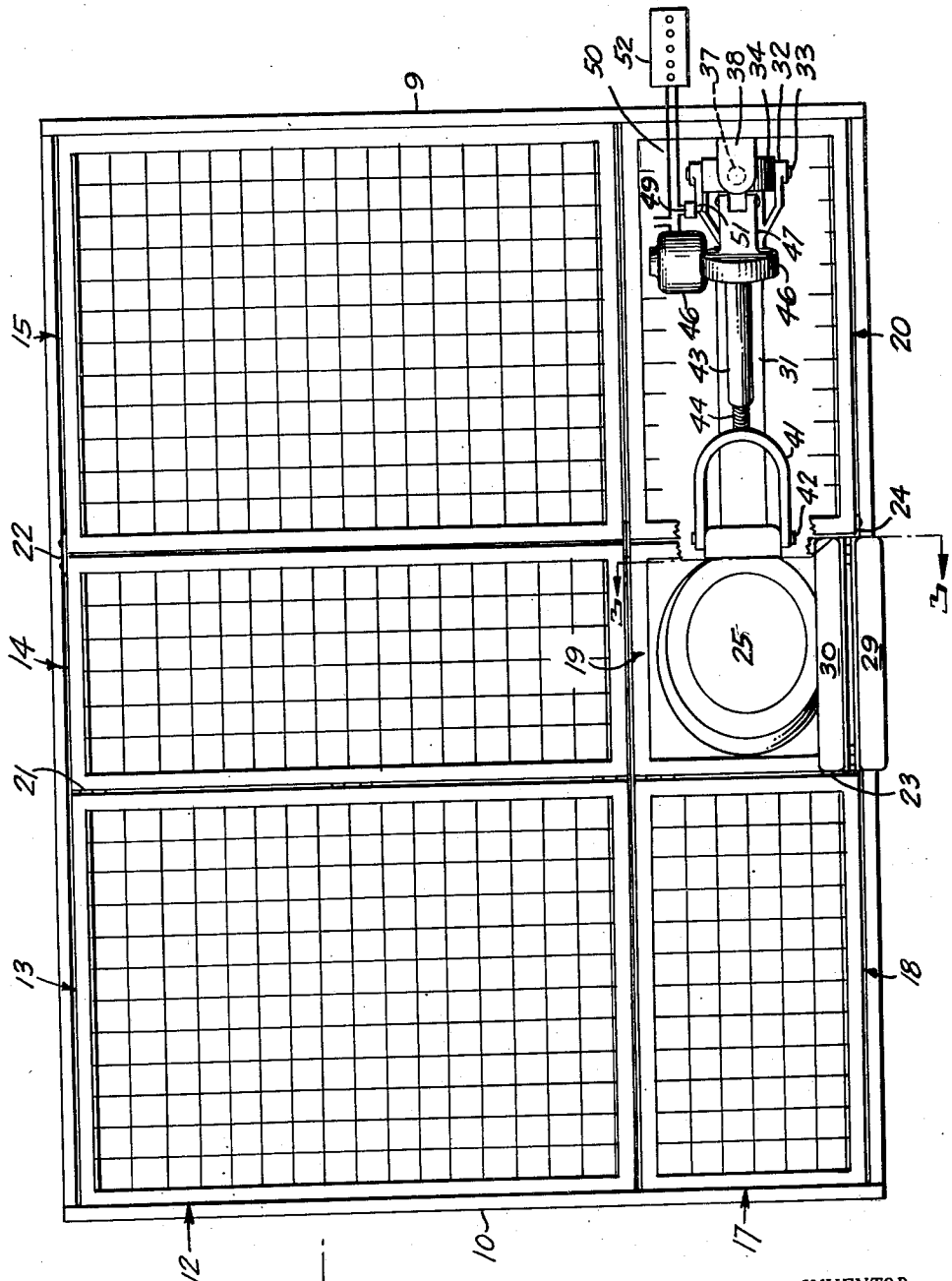


Fig. 1

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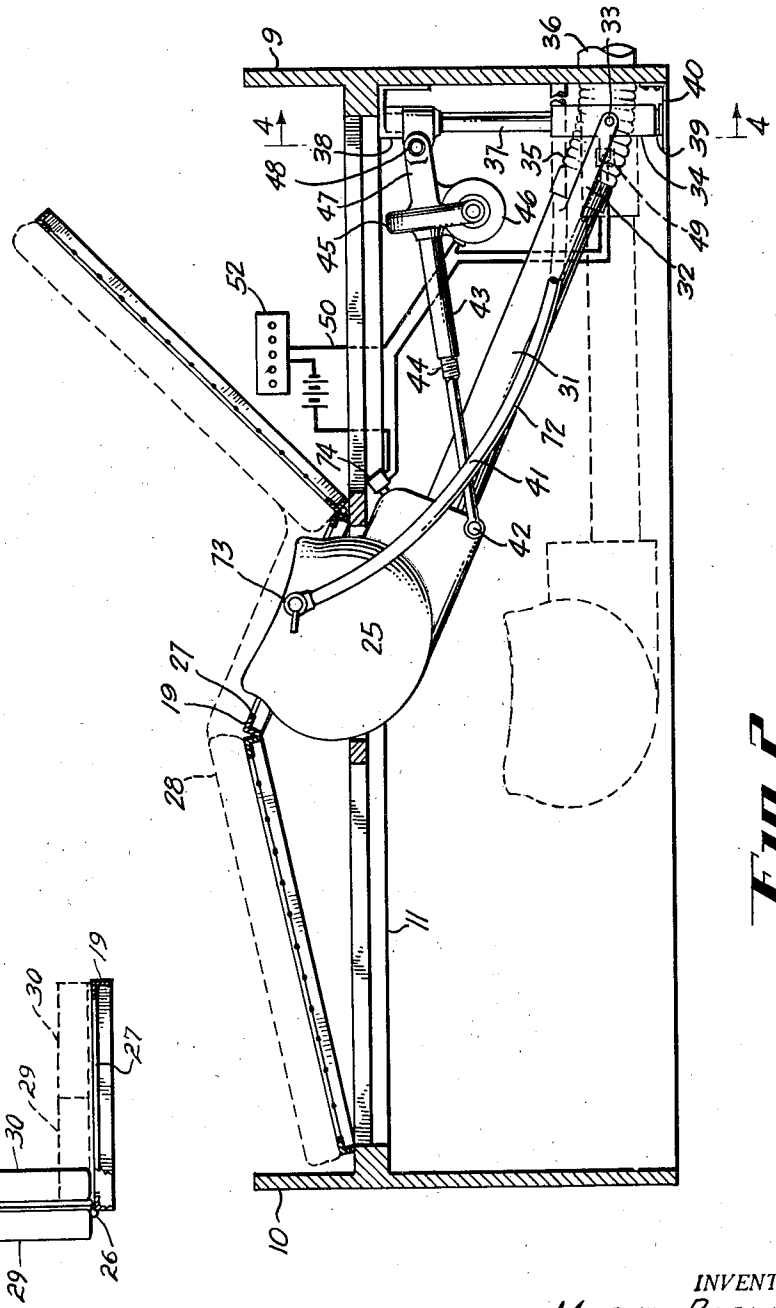


Fig. 2

Fig. 1

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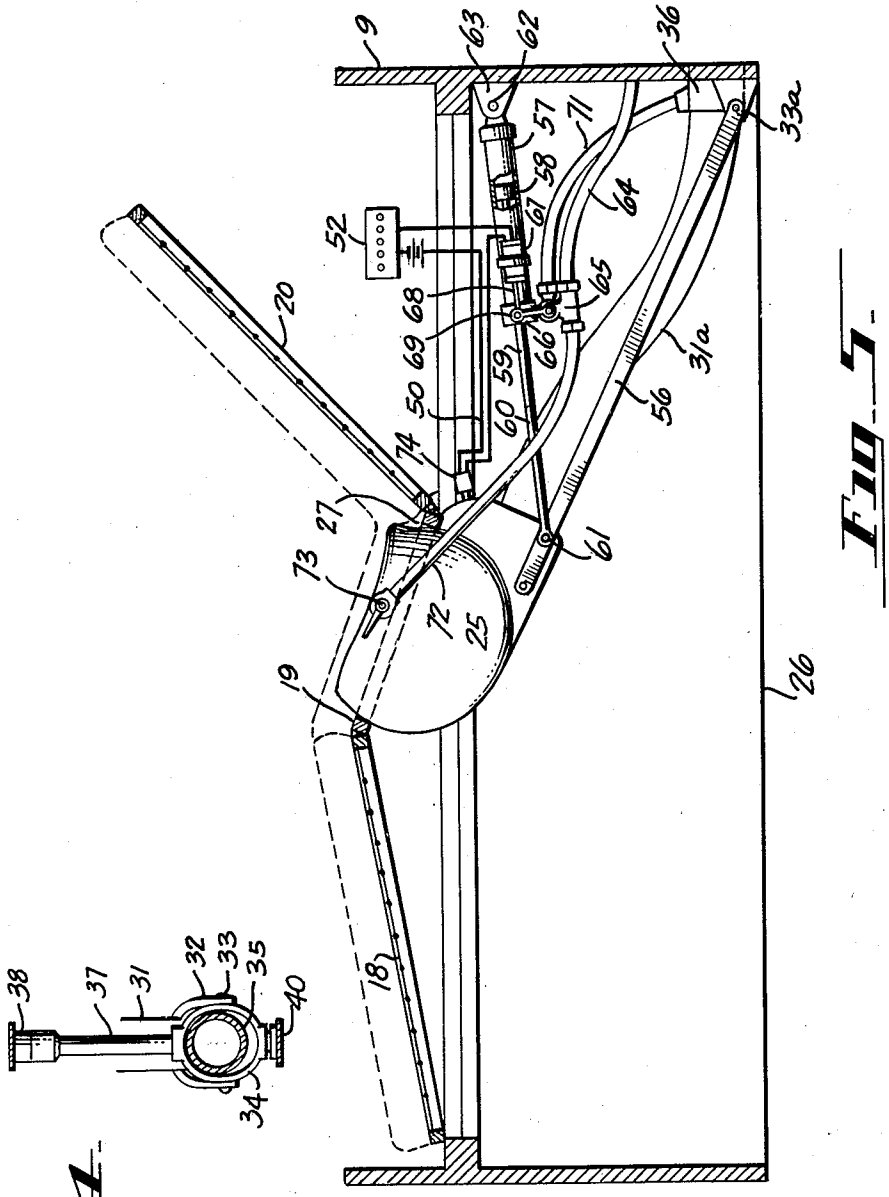


Fig. 5.

Fig. 4.

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UNITED STATES PATENT OFFICE

2,500,738

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Application July 3, 1945, Serial No. 603,037

21 Claims. (Cl. 5—90)

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This invention relates to 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 a patient in a semi-upright position sufficiently approximating the normal seated position in the use of a toilet, to permit a substantially normal evacuation process. More specifically, the invention aims to provide, in a bed having a flushable toilet, an arrangement whereby the body of the patient may be supported in a proper relation to the bowl, and in a comfortable reclining position, conducive to evacuation. 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 bottom to an inclined position, and bringing the toilet bowl to a position such that the patient may be supported between the thigh portion and an inclined back section of the bed bottom, with the toilet bowl in proper relationship to the patient.

In order that the bowl may be brought to a proper operative position with relation to the body of 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 while in the inoperative position. Consequently, a further object of the invention is to provide for concealing 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, inoperative position to its inclined, operative position. To this end, the invention contemplates an arrangement wherein the bowl is carried on the end of an arm or arms, adapted to swing about a fixed pivot which is located near the floor and at a distance horizontally from the bowl, the upward swinging movement of said arm or arms serving both to elevate the bowl and to swing it to an inclined position.

Another object is to provide an arrangement wherein the toilet may be flushed either in its elevated or in its lowered position. This object is attained by providing a waste or drain pipe which has a connection between the bowl and a sewer outlet at a level near the floor, and by providing a flushing connection between the bowl and the water supply. Such connections include relatively movable tube members and tubular means joining said tube members for such relative movement, whereby to provide for raising and lowering of the bowl. The waste pipe may be flexible or provided with a flexible connection with the sewer outlet, in order to provide the tubular joint in the waste pipe connection. Such joint is located near the axis of vertical swinging movement of the bowl.

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A further object of the invention is to provide mechanism for elevating the bowl which is relatively simple and yet at the same time is capable of sustaining that portion of the patient's weight that is imposed upon the bowl. A further object is to provide elevating mechanism that is so arranged that there will be maximum freedom of obstruction of the floor space beneath the bed, in order that cleaning of such floor space may be facilitated. These several objects are attained by providing a power operated device adapted to exert a pull between the bowl or the bowl arm and an anchor point located generally above the axis of swinging movement of the bowl.

Another object of the invention is to provide for swinging of 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 supporting mechanism on which the bowl may swing freely and relatively noiselessly in a horizontal direction.

This object is attained by suspending the bowl for horizontal swinging movement on the end of the previously mentioned arm mechanism, about a vertical pivot. In this manner the bowl is supported for off-the-floor swinging movement from a position beneath the bed to a position projected beyond one side of the bed.

Another object of the invention is to provide a bowl suspending and elevating mechanism which prohibits the elevation of the bowl whenever the bowl is displaced horizontally from its normally inoperative position centered beneath the opening in the bed.

A further object is to provide a bowl elevating mechanism which provides for automatically terminating the elevating movement when the upper limit thereof is reached.

Other objects of the invention will appear in the ensuing specification when considered in connection with the appended drawings, wherein:

Fig. 1 is a plan view of a bed embodying the in-

vention, the electrical control mechanism therefor being shown schematically;

Fig. 2 is a longitudinal sectional view of the bed taken through the narrow toilet section of the bed and showing the bed and toilet mechanism raised for use of the toilet;

Fig. 3 is a transverse sectional view taken on the line 3—3 of Fig. 1;

Fig. 4 is a transverse sectional view taken on the line 4—4 of Fig. 2; and

Fig. 5 is a longitudinal view of a bed embodying a modified form of the invention, the electrical control mechanism thereof being shown schematically.

As an example of one form in which the invention may be embodied, I have shown in Figures 1–4 inclusive a bed including a head 9, a foot 10, a removable mattress supporting bed bottom 12 comprising three sections 13, 14 and 15 hinged together at 21 and 22, and a narrow bed bottom 17 comprising sections 18, 19 and 20 hinged together at 23 and 24. The sections may be raised to the inclined positions shown in Fig. 2. Suitable mechanism which may be of a known type, and therefore is not shown in the drawings, is provided for raising these sections.

The toilet bowl 25 is adapted to move vertically from a position near the floor (indicated in broken lines) to the position shown in Fig. 2, in which position the bowl projects upwardly through an opening 27 in the thigh part 19 of the narrow section 17. The upper extremity of the bowl 25, in this position, is sufficiently below the upper surface of the mattress (indicated in broken lines at 28) that the compression of the mattress under the patient's weight may bring the thighs of the patient into contact with the bowl 25.

The opening 27 is normally covered by a two-part cover including a section 29 hinged at 26 to the frame 11 and a section 30 hinged at 26*a* to the section 29. Each of these sections includes a small section of mattress which, when the cover is over the opening, lie flush with the remainder of the mattress. The bowl 25 is attached to a waste or drain pipe 31 which has at its rear end a pair of arms 32 hinged at 33 to a bracket 34, which, as shown in Fig. 4, is of annular form to receive a flexible tube 35 which passes therethrough. The flexible tube 35 connects the pivoted end of the waste pipe 31 to a tube member 36 which communicates with a sewer outlet 36. The axis of hinges 33 passes through the flexible tube 35 in order to permit the drain pipe 31 to swing with a minimum of flexing of the tube 35.

The bracket 34 has a shaft portion 37 extending upwardly and journalled at its upper end in a bearing 38 attached to the bed frame. The lower end of the bracket 34 is pivoted at 39 to a bracket 40 attached to the head 9. The pivot 39 and bearing 38 provide a vertical axis about which the bracket 34 may pivot.

The bowl 25 is suspended by means of the drain pipe 31, the fork 32, and a screw jack which includes a fork 41 pivoted at 42 to the bowl, a sleeve 43 into which the threaded shaft 44 of the fork 41 is threaded, a gear reduction unit 45 driving the sleeve 43, a motor 46 driving the gear reduction unit 45, and a bracket 47 pivoted at 48 to the upper end of the shaft 37.

The motor 46 is a reversible motor. Rotation of the motor in one direction draws the shaft 44 into the sleeve 43, thereby elevating the bowl 25. Rotation of the motor in the other direction expels the shaft 44 from the sleeve 43, permitting the bowl 25 to return to its inoperative position under its own weight.

Being connected directly between the rotatable bracket 34 and the bowl, the screw jack forms part of a unit (together with the bowl 25 and drain pipe 31) which is freely rotatable about the axis of the shaft 37 for swinging the bowl horizontally while carrying it in a suspended position, out of contact with the floor.

Provision is made for rendering the elevating mechanism operative when the bowl is in a position beneath the opening 27. Such mechanism comprises a limit switch 49 in the circuit 50 of the motor 46, and an arm 51 on the bracket 34 which contacts the switch 49 when the bowl 25 is in said position, and closes the circuit 50. With the switch 49 thus closed, the motor 46 may be energized by pressing an appropriate control button in the control box 52.

In the form of the invention shown in Fig. 5, the bowl 25 is connected to the pivot 33*a* by a pair of arms 56 which are entirely separate from the drain pipe 31*a*, the pipe 31*a* being flexible throughout its length. Instead of the screw jack shown in Fig. 2 I provide, for elevating the bowl, a hydraulic motor including a cylinder 57, a piston 58 operating therein, a piston rod 59 connected to the piston 58 and having at its end a fork 60 pivoted at 61 to the bowl 25, and a pivotal connection 62 between the cylinder 57 and a bracket 63 on the head 9 of the bed.

The hydraulic motor is operated by water under pressure delivered through a pressure line 64 leading from a water main, and a valve 65 which is connected to the cylinder head 66 through which the water enters the cylinder 57. The valve 65 is remotely controlled from a control box 52 through a solenoid 67 which has an armature pivoted to the valve lever 69. The valve 65 is a two-way type which in one position (determined by energization of the solenoid 67) directs water into the cylinder 57, and in another position, permits the water to be expelled from the cylinder 57 and through a tube 71 into the sewer outlet 36. The expulsion of the water will result from the weight of the bowl 25 pulling the piston rod 59 to an extended position.

In each form of the invention, a water hose 72 leads from the source of water supply to the flushing outlets of the bowl 25 through a flushing valve 73 attached to the bowl.

It will now be apparent that in each form of the invention there is provided a drain pipe connection between the bowl and the sewer outlet and a flushing connection between the bowl and a water supply, said connections each including relatively movable tube members and tubular means joining said tube members for such relative movement whereby to provide for the bowl movements described above. For example, in Fig. 2, relatively movable tube members 31 and 36 are joined by a tubular joint 35 which is flexible to provide for the relative movement, and the relatively movable tube members of the water supply connection (upper and lower portions of flexible tube 72) are joined by the flexible intermediate portion of said tube. In Fig. 5, the drain connection includes relatively movable tube members which may comprise the outlet of bowl 25 (or upper portion of tube 31*a*) and the fixed tube member 36, together with flexible tubular means 31*a* joining these tube members for relative movement, and the water supply connections include relatively movable tube members 65 and

73 and the flexible tubular joint 72 joining these tube members.

Upward movement of the bowl is limited at a position where it is properly related to the thigh section 19 of the bed. This is acomplished through the use of a limit switch 74 in the circuit 50 of the motor 46 (or solenoid 67, as the case may be) adapted to be contacted by the bowl 25 when the latter has reached a proper position, and to thereby open the circuit 50. The switch 74 is therefore a self-closing switch. The solenoid 67 is provided with suitable spring means (not shown) for reversing the valve 65 when the solenoid is deenergized.

I claim as my invention:

1. A bed comprising a fixed frame, an inclinable bed bottom section hinged thereto, said bed bottom section having a bowl receiving opening, a toilet bowl, a waste pipe having one end pivoted to said fixed frame on a horizontal axis horizontally removed from and below said opening and its other end attached to the bowl, whereby to form therewith a swinging assembly adapted to guide the bowl in substantially vertical swinging movement from a lowered position beneath the bed to a position associated with said opening from below, and a pulling device arranged to exert a pull between said assembly at a point near the bowl and a point on said fixed frame above said horizontal axis, whereby to elevate the bowl.

2. In a bed including a horizontal bed bottom section provided with a bowl receiving opening, a toilet bowl adapted to move from an inoperative position below said opening to either a raised position operatively associated with said opening or to a position projected horizontally from beneath the bed, bearing means arranged on a substantially vertical axis horizontally spaced from said bowl, and suspension means for said bowl including means acting in tension between said bowl and said bearing means at a point near the upper end of said axis, means operative to foreshorten the effective length of said tension means so as to elevate said bowl, and means acting in compression between said bowl and said bearing means at a point near the lower end of said axis for maintaining said bowl at a substantially fixed distance from said latter point while permitting it to swing vertically in an arcuate path around said latter point, said tension means and said last mentioned means being connected to said bearing means for horizontal swinging movement along with said bowl about said axis.

3. In a bed including a horizontal frame portion provided with a bowl receiving opening, a toilet bowl adapted to move from a lowered position beneath said opening to an elevated position in operative association with said opening or to a position projected horizontally from beneath the bed, a substantially vertical post member, bearing means supporting said post member for rotative movement about a substantially vertical axis, a strut member pivotally connected to said post near the lower end thereof and connected to said bowl for guiding the bowl in swinging movement in an arcuate vertical path around said pivotal connection and in an arcuate horizontal path about said vertical axis, and means acting in tension between said bowl and said post member near the upper end of the latter for suspending the bowl for off-the-floor horizontal swinging movement and for elevating movement.

4. A bed comprising a fixed frame, an inclinable bed bottom section hinged thereto, said bed bottom section having a bowl-receiving opening,

a toilet bowl, a drain pipe connected at one end to said bowl and at its other end to a sewer connection, means pivoted at one end to said frame on a horizontal axis horizontally removed from and below said opening and at its other end attached to said bowl, whereby to form a swinging assembly adapted to guide the bowl in substantially vertical swinging movement from a lowered position beneath the bed to a raised position associated with said opening from below, said drain pipe being associated with the last-named means for swinging movement therewith, means acting in tension between said assembly at a point near the bowl and a point on said fixed frame above said horizontal axis, for supporting the bowl, and means for foreshortening said tension means to elevate the bowl.

5. In a bed, a frame structure including a bed bottom section provided with a bowl receiving opening; a toilet bowl; means attaching said bowl to said frame structure for elevation from a lowered position beneath said opening to an operative position communicating with said opening from below; a waste pipe connection between said bowl and a sewer outlet, a flushing connection between said bowl and a water supply, said waste pipe and drain 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 attaching means including means acting in tension between said bowl and a fixed part of the bed at a point above the median position of vertical movement of the bowl, means operative to foreshorten and lengthen said tension means so as to elevate and lower said bowl, and means acting in compression between said bowl and a fixed part of said frame structure at a point below said median position for maintaining said bowl at a substantially fixed distance from said latter point as the bowl is elevated.

6. In a bed, a bed bottom provided with a bowl receiving opening; a toilet bowl; a waste pipe connection between said bowl and a sewer outlet, a flushing connection between said bowl and a water supply, said flushing connection and waste pipe connection each including relatively movable tube members and tubular means joining said tube members for such relative movement, whereby to provide for movement of said bowl from a lowered position beneath the bed to a position communicating with said opening from beneath, and for substantially horizontal swinging movement of the bowl; and means suspending the bowl for off the floor swinging movement in an arcuate horizontal path about a substantially vertical axis horizontally spaced from the bowl, from a lowered position beneath the bed to an external use position projected beyond the side of the bed and disposed closely adjacent the floor.

7. A bed including a fixed frame and a bed bottom provided with a bowl receiving opening; a toilet bowl; means attaching said bowl to said fixed frame for compound swinging movements including a movement from a lowered position beneath the bed to a raised position communicating with said opening from below and a horizontal swinging movement in an arcuate path from a lowered position beneath the bed to an external use position near the floor and projected beyond the side of the bed; a waste pipe connection between said bowl and a sewer outlet, a flushing connection between said bowl and a water supply, said flushing connection and waste pipe connection each including relatively movable tube mem-

bers and tubular means joining said tube members for such relative movement, whereby to provide for said bowl movement, and means for elevating and supporting the bowl in said raised position.

8. A bed including a fixed frame and a mattress supporting frame having a bowl receiving opening located directly adjacent one side of the bed; a toilet bowl; means attaching said bowl to said fixed frame for compound movements including a substantially vertical swinging movement between a lowered, inoperative position beneath the bed to a raised position communicating with said opening from below, and a substantially horizontal arcuately swinging movement from a position beneath the bed to an external use position near the floor and projected beyond the side of the bed; a waste pipe connection between said bowl and a sewer outlet, including relatively movable parts accommodating said compound movements, and means for elevating and supporting said bowl in said raised position.

9. A bed including a fixed frame structure and a sectional mattress supporting bed bottom including a thigh section having an opening and hinged to said fixed frame for movement from a normal, horizontal position to an inclined position facing upwardly and towards the head of the bed; a toilet bowl; means attaching said bowl to said fixed frame structure for compound movements including a substantially vertical swinging movement from a lowered, inoperative position beneath the bed to a raised position communicating with said opening from below, and a substantially horizontal swinging movement from said inoperative position to an external use position near the floor and projected beyond the side of the bed; a waste pipe connection between said bowl and a sewer outlet; and a flushing connection between said bowl and a water supply; said waste pipe and flushing connections each including relatively movable tube members and tubular means joining said tube members for such relative movement, whereby to provide for said bowl movements.

10. In a bed, in combination: a bed frame structure including foot and head portions; a sectional bed bottom including a thigh section pivotally mounted on said frame structure for elevation to an inclined seating position facing upwardly and toward the head portion, said section having an opening; a toilet bowl; means mounting said bowl for elevation from a lowered position beneath said opening to an operative position communicating with said opening from beneath and inclined to face upwardly and toward the said head portion; a drain pipe connection between said bowl and a sewer outlet; and a flushing connection between said bowl and a water supply, said flushing connection and drain pipe connection each including relatively movable tube members and tubular means joining said tube members for such relative movement, whereby to provide for said bowl movement.

11. In a bed, in combination: a frame structure: a sectional bed bottom one section of which is pivotally mounted on said 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 drainpipe connection between said bowl and a sewer outlet; and a flushing connection between said bowl and a water supply, said flushing connection and drain pipe connection each including relatively movable tube members and tubular means joining said tube members for such relative movement, whereby to provide for said bowl movement.

12. A bed as defined in claim 11, including a retractable cover for said opening.

13. In a bed, in combination: a frame structure including head and foot portions; a sectional bed bottom including sections defining a normal occupancy supporting area at one side of the bed, and sections defining an auxiliary supporting area at the other side of the bed, separated from said normal occupancy supporting area along a dividing line extending longitudinally of the bed; said last mentioned sections including a back rest section pivoted to said frame structure so that it may be elevated to an inclined back supporting position; a thigh section having an opening and pivotally mounted on said frame structure for elevating movement to a seating position in which it is inclined so as to face upwardly and toward the said head portion, and a leg rest section hinged to said thigh section and moving therewith; a toilet bowl; means mounting said bowl for elevation from a lowered position beneath said opening to an operative position communicating with said opening; a drainpipe connection between said bowl and a sewer outlet; and a flushing connection between said bowl and a water supply, said flushing connections and drain pipe connection 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 normal occupancy area cooperating with said auxiliary supporting area whereby a patient may move himself from a normal resting position to a position above the toilet and vice versa, and said auxiliary supporting area being adapted to support the patient in at least a partially upright seated position facilitating the use of the toilet.

14. A bed as defined in claim 11, including power operable means for elevating said bowl from an inoperative position beneath said frame structure to a position operatively presented to said opening.

15. In a bed, a fixed frame, a sectional toilet seat bottom supported on said fixed frame, said toilet seat bottom having a width less than half the total width of the bed; and a sectional bed bottom supported on said fixed frame alongside said toilet seat bottom and providing a normal resting area for an occupant, said toilet seat bottom and said bed bottom each comprising a seat section and a back rest section hinged to said fixed frame, and a leg rest section hinged to said seat section to form a knee joint.

16. In a bed, a fixed frame, a sectional toilet seat bottom supported on said fixed frame, said toilet seat bottom having a width approximately one-third the total width of the bed; and a sectional bed bottom having a width approximately two-thirds the total width of the bed, supported on said fixed frame alongside said toilet seat bottom and providing a normal resting area for an occupant, said toilet seat bottom and said bed bottom each comprising a seat section and a back rest section hinged to said fixed frame, and a leg rest section hinged to said seat section to form a knee joint.

17. In a bed, a fixed frame, a sectional toilet seat bottom supported on said fixed frame, said toilet seat bottom having a width less than half

the total width of the bed; and a sectional bed bottom supported on said fixed frame alongside said toilet seat bottom and providing a normal resting area for an occupant, said toilet seat bottom and said bed bottom each comprising a seat section and a back rest section hinged to said fixed frame, and a leg rest section hinged to said seat section to form a knee joint, the seat section of said toilet seat bottom having an opening, a toilet bowl, a waste pipe connection between said bowl and at a fixed sewer outlet, and a flushing connection between said bowl and a water supply connection, said flushing and waste pipe connections each including relatively movable tube members and tubular means joining said tube members for relative movement, whereby to provide for elevation of the bowl from a lowered position beneath said opening to an elevated position communicating with said opening from below, and means for effecting such movement of the bowl and for supporting it in elevated position.

18. In a bed, a frame, a pair of separate sectional bed bottom portions each including a back rest and thigh section carried by said frame and hinged together for elevating movement toward each other, and a leg rest hinged to said thigh section to provide a knee joint, said bed bottom portions being arranged side by side to normally provide conjointly a substantially continuous bed surface, one of said bed bottom portions providing a toilet seat and having a toilet opening, a toilet bowl beneath said one bottom portion, cooperable with said opening, and lift mechanism having common drive mechanism and parts adapted to simultaneously elevate both of said bed bottom portions in continuously registering relation, whereby a person may, at any stage of such elevation, easily move from said normal resting surface onto said toilet seat and back.

19. A bed comprising a fixed frame; a normally level bed bottom including a thigh section that is raisable to an inclined position, said thigh section having an opening; a toilet including a bowl and means connecting said bowl to said fixed frame for arcuate swinging movement from a lowered, inoperative position to an elevated position presented to said opening and inclined to correspond approximately to the inclination of said thigh section; a drain pipe connection between said bowl and a sewer outlet; a flushing connection between said bowl and a water supply; said connections each including movable tubular joint means accommodating said bowl movement; means for elevating said bowl and supporting the same in the elevated position; and a separate bed bottom including a thigh section raisable in unison with said first mentioned thigh section, said second bed bottom providing a normal resting area extending from head to foot and from one side toward the other side of the bed a distance less than half the width of the bed, and said first mentioned bed bottom having a width less than half the width of the bed on said other side and normally cooperating with said second bed bottom to provide a substantially continuous supporting surface.

20. A bed as defined in claim 11, including means for elevating said bowl from said lowered position to said operative position and for supporting the bowl in said operative position, said last means comprising a screw jack and power operable means for actuating the same.

21. A bed as defined in claim 11, including means for elevating said bowl from said lowered position to said operative position and for supporting the bowl in said operative position, said last means comprising a hydraulic motor having cylinder and piston rod members operably engaged between said bowl mounting means and said fixed frame.

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