

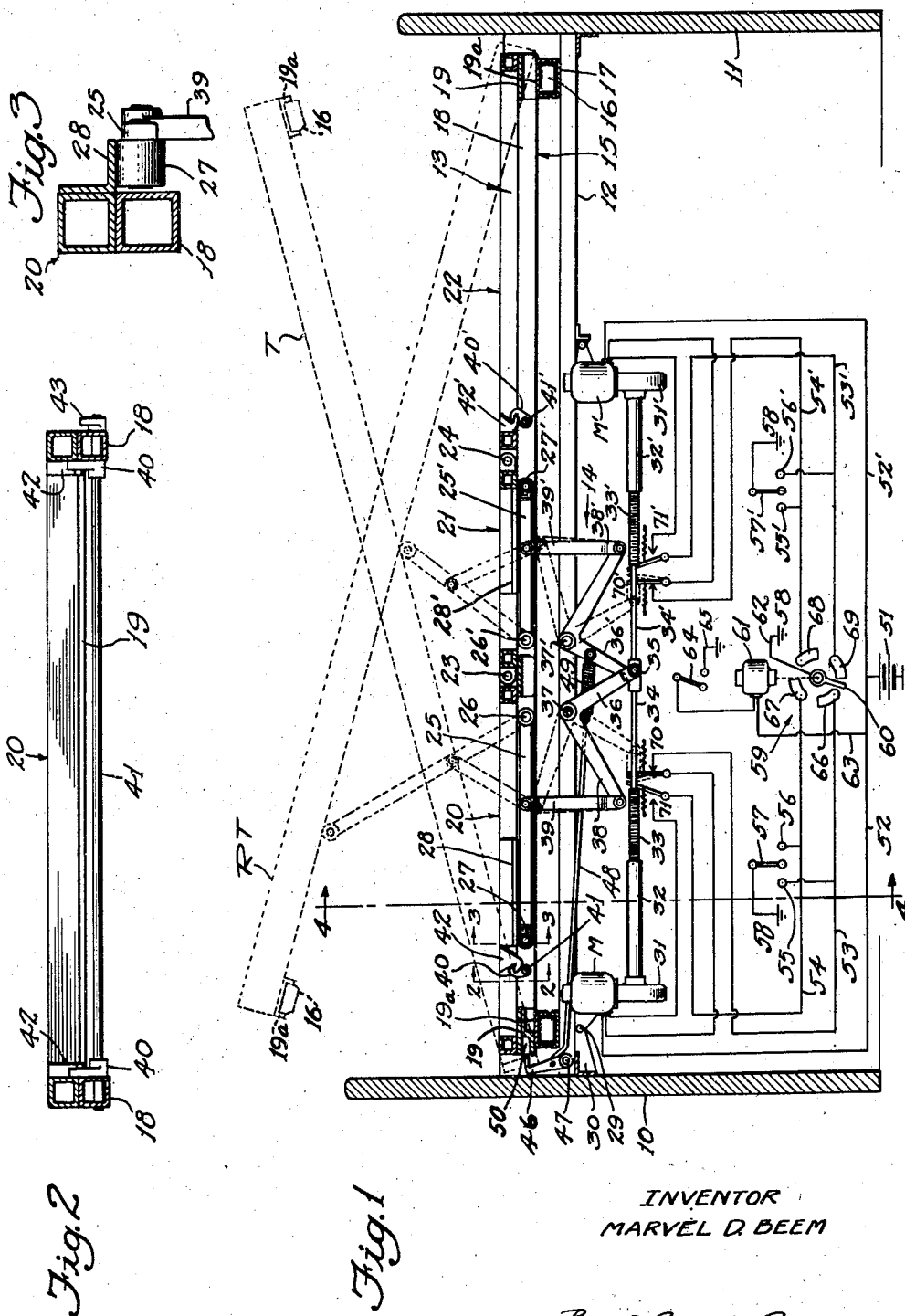
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HOSPITAL BED

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2 Sheets-Sheet 1



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2 Sheets-Sheet 2

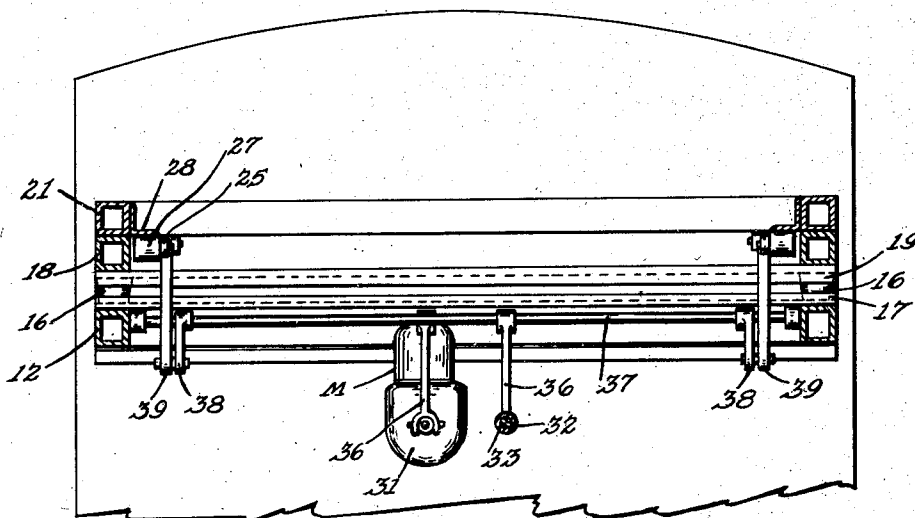


Fig. 4

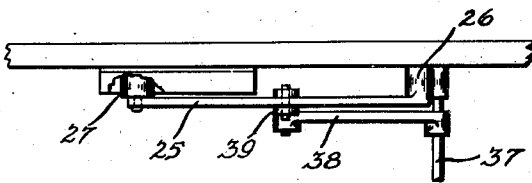


Fig. 5

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This invention relates to hospital beds. It deals particularly with the lift mechanism of a hospital bed, and has as its general object to provide a hospital bed in which the same lift mechanism is employed alternatively for lifting the hinged sections of the bed to seat forming positions, or for longitudinally tilting the entire mattress supporting frame of the bed either to a "Trendelenburg" position or a "reverse Trendelenburg" position.

Another object of the invention is to provide a hospital bed, which in addition to mechanism for producing the "Trendelenburg" and the "reverse Trendelenburg" positions, is adapted to continuously oscillate the mattress frame between the "Trendelenburg" and "reverse Trendelenburg" positions for cardio-therapy treatments.

In general, these objects are attained by attaching the hinged mattress supporting frame sections to a rigid subframe which is free to be elevated; by applying the lifting force directly to the hinged sections so that normal operation of the elevating mechanism will cause only the hinged section to raise; and by providing means for locking the hinged sections to the subframe so that the lifting force applied to the hinged sections will be transmitted to the subframe, whereby the entire mattress supporting frame may be lifted as a rigid unit.

The mattress supporting frame sections are hinged, in a generally conventional manner, to the subframe with the head rest and thigh section hinged to each other and to the subframe and with the foot rest hinged to the thigh section to form a knee joint. Lifting pressure is applied to the head rest and to the thigh section near the knee joint. One of the problems that I have encountered in the development of the invention is the possibility of the entire mattress supporting frame tilting about the axis of contact of the lifting means with the thigh section in the event that downward pressure is applied to the foot end of the frame. To prevent such tilting, the invention provides means whereby the head end of the frame may be restrained against moving upwardly whenever the thigh section is being elevated. However, a further problem has been encountered in connection with this feature of the invention, namely, that when the thigh section and head rest are being elevated for the normal seating position, the head rest must of course be free to be elevated simultaneously with the thigh section. Accordingly, the invention provides for applying the restraining force to the head end of the subframe, leaving the head rest free to be elevated at any time.

Another object of the invention is to provide a hospital bed incorporating all of the above

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mentioned features and yet relatively simple and inexpensive in construction.

Another object is to provide an automatic control for the oscillating feature.

Other objects of the invention will appear from a perusal of the following specification, in connection with the appended drawing, in which:

Fig. 1 is a longitudinal sectional view through a hospital bed embodying the invention;

Fig. 2 is a transverse sectional view of the same taken on the line 2—2 of Fig. 1;

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

Fig. 4 is a transverse sectional view of the bed, taken on the line 4—4 of Fig. 1; and

Fig. 5 is a plan view of one of the elevator units.

As an example of one form in which the invention may be embodied, I have shown in the drawings a hospital bed embodying a head panel 10, a foot panel 11, longitudinal rails 12 connected to the head and foot panels 10 and 11 to form a rigid bed frame structure, and a mattress supporting frame 13 carried by the rails 12, together with elevating mechanism which is indicated generally at 14.

The mattress supporting frame 13 includes a subframe 15 which embodies longitudinal rail members 18 connected at their ends by transverse bars 19 and transverse channels 19a. Secured in the channels 19a, at the ends thereof, are supporting elements 16 which normally rest in channels 17 but may lift out of the channels 17 to permit the mattress supporting frame 13 to be elevated to the Trendelenburg positions referred to hereinafter.

The mattress supporting frame 13 also includes three hinged sections 20, 21 and 22, of which the section 20 (head rest) and the section 21 (thigh section) are hinged to each other and to the subframe 18 through hinge mechanism 23. The foot rest 22 is hinged to the thigh section 21 by hinge mechanism 24. The free ends of the head rest 20 and foot rest 22 are adapted to rest against the transverse members 19 when in their lowered, aligned positions.

The elevating mechanism for the head rest 20 includes a pair of arms 25 hinged at 26 to the inner side of the rails 18 and having at their opposite ends rollers 27 which engage L-section rails 28 that are secured to the head rest 20. Elevating power is derived from a motor M which is pivoted at 29 to a bracket 30 attached to the head panel 10. Such power is transmitted through reduction gearing 31 to an internally threaded sleeve 32 that coacts with a threaded shaft 33 threaded thereto. The threaded shaft 33 forms part of a push rod 34 which is pivoted at 35 to a lever 36. The lever 36 is secured to a

shaft 37 which carries a pair of arms 38 that are linked to the arms 25 through links 39.

Similar mechanism, including a motor M', reduction gearing 31', an internally threaded sleeve 32', a threaded shaft 33', a push rod 34', an arm 36', a shaft 37', a pair of arms 38', and a pair of links 39', functions to transmit lift through a pair of arms 25' and rollers 27' to the thigh section 21 through L-section rails 28' secured to the thigh section 21. Arms 25 are hinged at 26' to the rails 18.

The head rest 20 may be locked to the subframe 18 by a pair of latches 40 which are carried by a shaft 41 journaled in the rails 18. The latches 40 coact with hooks 42 which are secured (as by welding) to the inner side faces of the side members of the foot rest 22. One end of the rod 41 projects beyond the outer side of the foot rest 22 and has secured thereto a handle 43 by means of which the shaft 41, and with it the latches 40, may be rotated so as to move the latches into and out of engagement with the hooks 42.

An identical latching arrangement, similar parts of which are indicated by corresponding reference numerals 40' etc., is used for latching the foot rest 22, adjacent the knee hinge 24, to the subframe 18.

With the latches 40' engaged with the hooks 42', elevating movement applied to the thigh section 21 through the rollers 27' will raise the foot end of the mattress supporting frame while the head end of the frame remains lowered. This position is indicated at T, and is known as the "Trendelenburg position."

With the latches 40 engaged with the hooks 42, elevating movement applied to the head rest through the rollers 27 will raise the head portion of the mattress supporting frame while the foot portion remains in engagement with the subframe 19. This position, indicated in broken lines at R/T, is known as the "reverse Trendelenburg position."

When the mattress supporting frame is being raised to the "Trendelenburg position," the head end thereof is restrained against elevating movement which might occur as the result of application of weight to the foot end of the mattress frame, causing the frame to teeter about the axis of the rollers 27'. To avoid this occurrence, I provide an interlock mechanism including a pair of hooks 46 which are pivoted at 47 to the fixed frame rails 12 and which are connected by operating rods 48 and extension springs 49, to the arms 36' of the thigh section elevating mechanism. Through this mechanism, the initial elevating movement of the thigh section raising mechanism will cause the hooks 46 to be projected into engagement with keepers 50 attached to a transverse member 19 of the subframe 15, and additional movement of the arm 36' will be permitted by the stretching of the coil springs 49, which exert only light tension between the arms 36' and the hooks 46. The engagement of the hooks 46 with the keepers 50 effectively prevents elevation of the head end of the subframe 18.

The motors M and M' are energized from a suitable source of current 51, through current supply conductors 52, 52'. The motors M, M' are reversible motors and their respective forward and reverse coils are connected to conductors 53, 53' and 54, 54' through the contacts 55, 55' and 56, 56' of two-way switches 57, 57' through which the respective coils may be connected to ground

58. The switches 57, 57' are manual switches and may be embodied in a suitable control box of any conventional construction. The switch 57 is utilized for selectively elevating and lowering the head rest 20, and the switch 57' is utilized for selectively elevating and lowering the knee hinge 24.

The oscillating operation is brought about through the medium of a timer which is designated generally at 59. The timer 59 embodies a rotatable commutator brush 60, driven by a motor 61, and connected to ground by a suitable connection 62. The motor 61 is connected to current supply by suitable conductor 63, and is under the control of a manual switch 64, grounded through a conductor 65.

As the brush 60 rotates, it consecutively engages a plurality of contacts 66, 67, 68 and 69, which are connected respectively to the conductors 53, 54, 53' and 54', thus consecutively making and breaking the circuits for elevating and lowering the head rest and for elevating and lowering the knee joint. The contacts 66-69 are of sufficient length circumferentially of the path of revolution of the brush 60, so that the duration of contact of the brush with each contact will be adequate to permit the desired amount of elevation and lowering of the mattress supporting frame. The upper and lower limits of said elevation and lowering will, however, be overcontrolled by limit switches 70, 71, 70' and 71' in the circuits 53, 54, 53' and 54'. All these limit switches are shown as being operated by movement of the rods 34 and 34' of the power units, such illustration being for the purpose of simplicity and clarity, it being understood that the limit switches may and preferably should be positioned to be directly engaged by the mattress supporting sections 20, and 21 or 22.

I claim as my invention:

1. In a hospital bed, a mattress supporting frame including a subframe; a head rest and a thigh section hinged to said subframe, and a foot rest hinged to said thigh section to provide a knee joint; lift mechanism operative to exert lifting pressure against said head rest and knee joint respectively; and means for locking said head rest and knee joint to said subframe to permit said mattress supporting frame to be elevated as a rigid unit.

2. In a hospital bed, in combination with a main supporting structure; a mattress supporting frame including a subframe, a head rest and thigh section hinged to said subframe, and a foot rest hinged to said thigh section to form a knee joint; lift mechanism operatively connected between said main supporting structure and said head rest and knee joint respectively and adapted to exert lifting pressure against said head rest and knee joint respectively; whereby to elevate said head rest and knee joint respectively without moving said subframe; and means for locking said head rest and knee joint to said subframe to permit the lift of said lifting mechanism to elevate said mattress supporting frame as a rigid unit.

3. In a hospital bed, in combination with a main supporting structure; a mattress supporting frame including a sub-frame, a head rest and thigh section hinged to said sub-frame, and a foot rest hinged to said thigh section to form a knee joint; lift mechanism operatively connected between said main supporting structure and said head rest and knee joint respectively and adapted to exert lifting pressure against said head

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rest and knee joint respectively, whereby to elevate said head rest and knee joint respectively without moving said subframe; and means for selectively locking either said head rest or said knee joint to said subframe to permit either end of said mattress supporting frame to be elevated as a rigid unit.

4. In a hospital bed in combination with a fixed frame structure; a mattress supporting frame including a subframe, a head rest and thigh section hinged to said subframe, and a foot rest hinged to said thigh section to form a knee joint; lift mechanism operatively connected between said fixed frame structure and said head rest and adapted to exert lifting pressure against said head rest so as to normally elevate the same without moving said subframe; and means for locking said head rest to said subframe to permit said lift mechanism to elevate said mattress supporting frame as a unit to a "reverse Trendelenburg" position.

5. In a hospital bed, in combination with a fixed frame structure; a mattress supporting frame including a subframe, a head rest and thigh section hinged to said subframe, and a foot rest hinged to said thigh section to form a knee joint; lift mechanism operatively connected between said fixed frame structure and said knee joint to exert lifting pressure against said knee joint so as to normally elevate the same normally without moving said subframe; and means for locking said knee to said subframe to permit said lift mechanism to elevate said mattress supporting frame including said subframe as a unit to a "Trendelenburg" position.

6. In a hospital bed, in combination with a fixed frame structure; a mattress supporting frame including a subframe, a head rest and thigh section hinged to said subframe and a foot rest hinged to said thigh section to form a knee joint; lift mechanism operatively connected between said fixed frame structure and said head rest and knee joint respectively and adapted to exert lifting pressure against said head rest and knee joint respectively for normally elevating said head rest and knee joint respectively without moving said subframe; means for locking said head rest and knee joint to said subframe to permit said lift mechanism to elevate said mattress supporting frame including said subframe as a rigid unit; and control means for effecting the consecutive alternate operation of said head rest and knee joint lift mechanism in a manner to raise and lower the head and foot ends of said mattress supporting frame in alternating succession.

7. In a hospital bed, in combination with a fixed frame structure, a mattress supporting frame normally supported by said fixed frame structure in a horizontal position, lift mechanism for elevating the head end of said mattress supporting frame while the foot end thereof remains fulcrumed against said fixed frame structure, lift mechanism for elevating the foot end of said mattress supporting frame while the head end thereof remains fulcrumed against said fixed frame structure, and control means for operating said lift mechanisms in alternating succession.

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8. In a hospital bed, in combination with a fixed supporting frame structure, a mattress supporting frame normally supported on said fixed frame in a horizontal position; and lift mechanism for raising and lowering the head and foot ends of said mattress supporting frame in alternating succession, with one end of said mattress supporting frame remaining fulcrumed against said fixed frame structure while the other end is being raised and lowered.

9. In a hospital bed, in combination with a fixed frame structure; a mattress supporting frame including a subframe, a head rest and thigh section hinged to said subframe, and a foot rest hinged to said thigh section to form a knee joint; lift mechanism operatively connected between said fixed frame structure and said head rest and knee joint respectively and adapted to exert lifting pressure against said head rest and knee joint respectively whereby to normally elevate said head rest and knee joint respectively without moving said subframe; means for locking said head rest and knee joint to said subframe to permit said lift mechanism to elevate said mattress supporting frame as a rigid unit; and means automatically operated in synchronism with said lift mechanism, and adapted to restrain elevation of one end of said mattress supporting frame while the other end is being elevated.

10. In a hospital bed, in combination with a fixed supporting frame structure, a mattress supporting frame normally supported on said fixed frame structure in a horizontal position; lift mechanism operatively connected between said fixed frame structure and a region of said mattress supporting frame intermediate the ends thereof and adapted to exert lifting pressure thereagainst for elevating one end thereof; and means automatically operated in synchronism with the operation of said lift mechanism for restraining operation of said other end of said mattress supporting frame while said one end is being elevated.

11. In a hospital bed, in combination with a fixed supporting frame structure, a mattress supporting frame normally supported on said fixed frame structure in a horizontal position; lift mechanism operatively connected between said fixed frame structure and a region of said mattress supporting frame intermediate the ends thereof and adapted to exert lifting pressure thereagainst for elevating one end thereof; and means for restraining operation of said other end of said mattress supporting frame while said one end is being elevated.

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