May 23, 1944. J. W. BUTTIKOFER ET AL 2,349,701

HOSPITAL BED

Filed June 26, 1941 2 Sheets-Sheet 1

Fig. 1

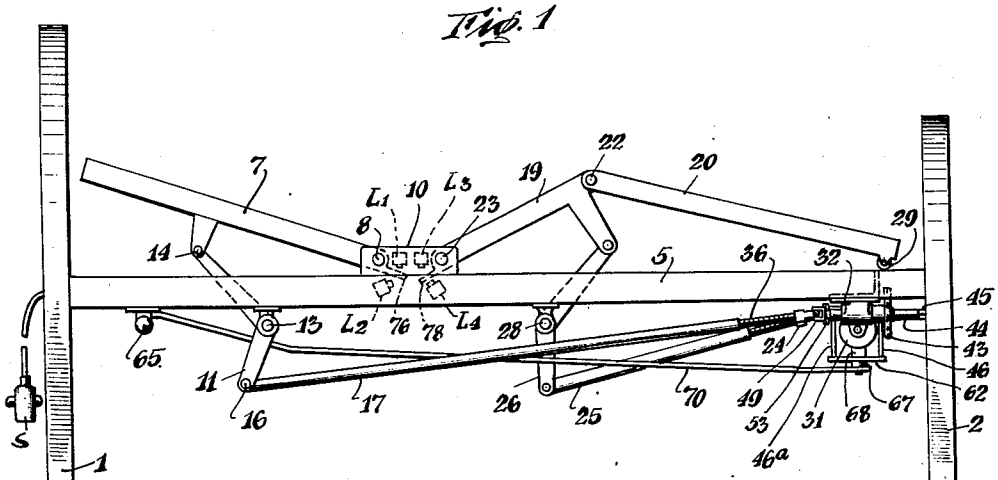

Fig. 4

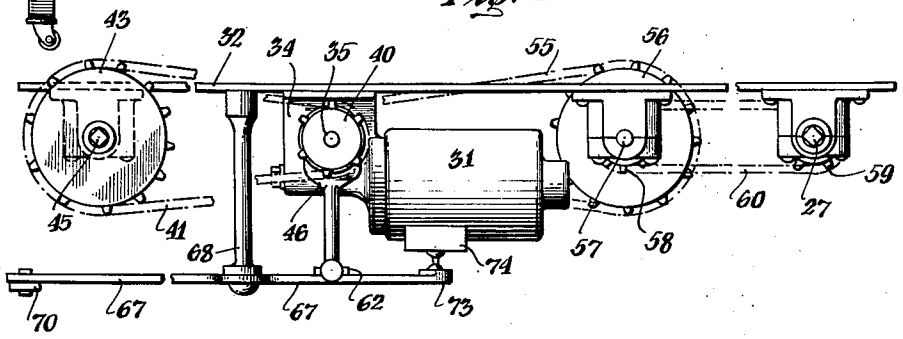

Fig. 6

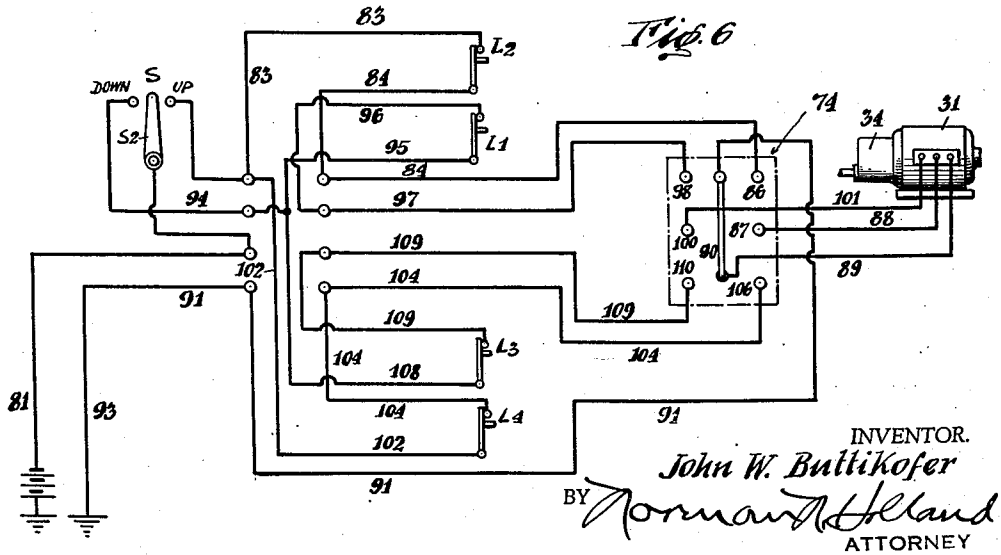

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Fig. 2

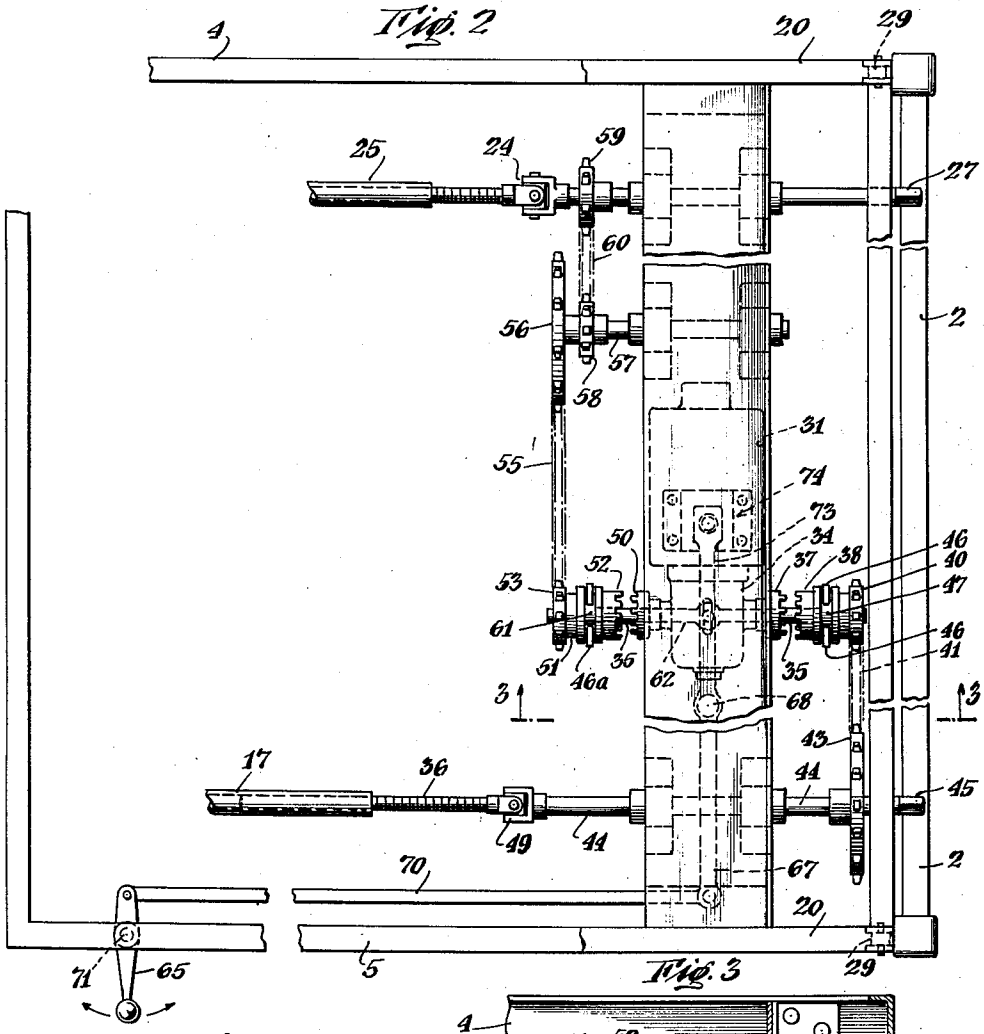


Fig. 3

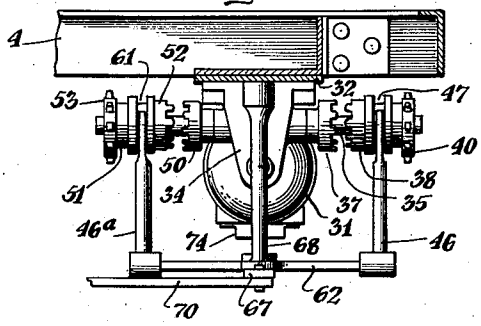
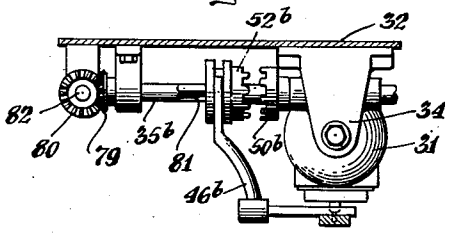


Fig. 5



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Patented May 23, 1944 2,349,701

UNITED STATES PATENT OFFICE

2,349,701

HOSPITAL BED

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Application June 26, 1941, Serial No. 399,851

2 Claims. (Cl. 5—69)

The present invention relates to hospital beds and more particularly to a motor operated hospital bed.

Hospital beds in use at the present time generally comprise upright head and foot end members connected by side members upon which is mounted a spring that is hinged at suitable points so that it may be adjusted in height to support the back and legs of a person. The back and leg supports are adjustable in height by manually operable cranks. The cranks are in most cases located adjacent the foot ends of the beds and in some cases at the side of a bed. Hospitals and institutions generally prefer to have the cranks located at the foot ends of the beds so that in a ward nurses or attendants may adjust the heights of all the beds from a central aisle. In neither of these types of bed is a bedridden patient able himself to adjust the positions of the back and leg supports; he must wait until an attendant is available to adjust the height of the supports by means of the cranks. This is at times very trying on both the patient and an attendant for the patient is uncomfortable and the attendant may be occupied with tasks which are at the moment more important than adjusting a bed.

If a patient is confined to his home, the difficulties may be increased in the event he is left alone in the house for any length of time. In this event there is no one to adjust the bed and for a patient to get out of bed and attempt it may aggravate his illness or injury.

The present invention aims to overcome the above and other objections by providing a new and improved means for adjusting the positions of the back or leg supports of a hospital bed which may be easily operated by a patient without getting out of bed. The invention further contemplates the provision of hospital bed operating means which may be easily and inexpensively manufactured and installed in new hospital beds or in those already in use.

An object of the present invention is to provide a new and improved hospital bed.

Another object of the invention is to provide a new and improved hospital bed adapted to be operated by a patient without getting out of bed.

Another object of the invention is to provide a motor operated hospital bed which is inexpensive to manufacture.

Another object of the invention is to provide a motor operated unit for hospital beds which may be easily and rapidly installed into hospital beds during the manufacture thereof.

A further object of the invention is to provide a motor operated unit for hospital beds which may be easily installed into existing manually operated beds.

Other and further objects of the invention will be obvious upon an understanding of the illustrative embodiment about to be described, or will be indicated in the appended claims, and various advantages not referred to herein will occur to one skilled in the art upon employment of the invention in practice.

A preferred embodiment of the invention has been chosen for purposes of illustration and description and is shown in the accompanying drawings, forming a part of the specification, wherein

Fig. 1 shows a side elevational view of a hospital bed embodying the present invention;

Fig. 2 is a fragmentary top plan view showing a preferred embodiment of the present invention;

Fig. 3 is a sectional view taken along the line 3—3 of Fig. 2;

Fig. 4 is an elevational view showing the preferred embodiment of the present invention;

Fig. 5 is an elevational view showing a modified form of the present invention; and

Fig. 6 illustrates a preferred form of wiring diagram for the motor operated hospital bed shown in the preferred figures.

Referring again to the drawings, and more particularly to Figs. 1 and 2 thereof, there is shown a hospital bed having head and foot members 1 and 2 and side members 4 and 5. A back support 7 is pivotally secured adjacent one end 8 thereof to a flange 10 on the side member so that it may swing about the pivot point 8. A bell crank 11 pivotally secured at 13 to a suitable bracket or cross rod has one end 14 thereof connected with the back support 7 and its other end 16 connected with an operating rod 17. The leg support comprises separate sections 19 and 20 each pivotally secured together at adjoining ends 22 thereof, the section 19 being movable about its lower pivoted end 23 by a second operating rod 25 through a bell crank 26 which is pivotally secured intermediate its ends to a bracket or cross rod 28. The free end of the leg supporting section 20 is preferably provided with rollers 29 at each side thereof which ride on the side members 4 and 5 of the bed during movement of the leg support. An electric motor 31 mounted on the bed frame adjacent the foot of the bed is adapted to actuate the operating rods

17 and 25 to raise and lower the back or leg supports.

The motor 31 which actuates the operating rods 17 and 25 to move the back and leg supports is preferably mounted, together with the means for operatively connecting it with the operating rods, on a base member 32. Preferably the motor is of the three wire, reversible type. The base member 32, together with the motor 31 and the means for connecting it so as to move the back and leg supports, forms a single compact unit which may be manufactured and supplied to hospital bed manufacturers as a complete unit ready for installation. The motor 31 is connected with the operating rod 17 for moving the back support 7 through suitable speed reducing means such as gear box 34, rotatable shaft 35, a clutch member mounted on the shaft 35 comprising cooperating clutch sections 37 and 38, fixed and movable, respectively, sprocket 40, drive chain or belt 41, and a sprocket 43 mounted on an extension 44 of the operating rod 17. The clutch member 38, and sprocket 40 may be formed from a single piece of material or may be built up into a unit from separate parts to form a unitary member. In Fig. 2 the cooperating clutch faces 37 and 38 are shown out of engagement with each other so that operation of the motor 31 will be ineffective to rotate the operating rod 17. The cooperating clutch sections 37 and 38 may be moved into and out of engagement with each other by means of a yoke member 46 which fits into an annular groove 47 formed on or carried by the unitary member which carries the clutch member 38 and the sprocket 40. The clutch member 37 is fixed to the shaft by a pin or key not shown. The shaft 35 connected with the gear box or speed reducing means 34 is fixed in position with respect to its longitudinal axis but is rotated by the motor 31 through the gear box 34. The unitary member which carries the clutch members 38 and sprocket 40 is free to move longitudinally along the shaft 35 and is also free to rotate about the shaft until it engages the other clutch section 37. When the clutch sections 37 and 38 are in engagement, the sprocket 40 will be rotated to thus move the chain or belt 41 and rotate the sprocket 43. Turning the sprocket 43 rotates the operating rod extension 44 and the screw member 36 which is connected therewith by a universal joint 49. Rotation of the screw member 36 raises and lowers the back support 7. The universal joint 49 permits the operating rod 17 to move freely and change its angle while moving the back support 7. The operating rod extension 44 preferably extends to a point adjacent the foot end of the bed and is provided with a squared end or other means 45 adapted to receive a crank for raising and lowering the back support in an emergency. Such an emergency might be caused by temporary failure of the power supply for the motor 31.

The operating rod 25 for moving the leg support is connected with the motor 31 through the gear box 34, rotatable shaft 35, clutch members 50 and 52, fixed and movable, respectively, sprocket 53, chain or belt 55 and sprocket 56, axle 57, sprocket 58, chain or belt 60 and sprocket 59. A universal joint 24 is preferably provided for the screw member which moves the leg support, so that the operating rod 25 is free to move and change its angle when moving the leg support. Also, the shaft for the sprocket 59 may have a squared end 27 for receiving a crank so as to operate the leg support in an emergency. When the clutch sections 50 and 52 are in engagement, the operating rod 25 will be effective to move the leg support and when these clutch sections are out of engagement, the motor 31 will be ineffective to move the leg support. The bushing or unitary member 51 which carries the clutch section 52 and sprocket 53 is preferably provided with an annular groove 61 for receiving a yoke member 46a. The clutch section 52 and sprocket 53 are movable longitudinally on the shaft and free to rotate about it until the clutch member 50 is engaged. Movement of the yoke axially of the shaft 35 is effective to move the clutch sections 50 and 52 into and out of engagement. The clutch section 50 is fixed to the shaft 35 by a key or a pin not shown. Preferably the yoke members 46 and 46a are connected together adjacent their ends by a rod or bar 62 (Fig. 3) so that when either pair of the clutch members at one side of the motor are in engagement the other pair of clutch sections will necessarily be out of engagement. In this way the motor 31 is effective to move only one of the supporting parts of the hospital bed at a time. The connecting bar 62 of the yoke members is in turn connected with operating means adapted to be moved by a patient, as will be described hereinafter.

It will be noted that the sprockets 40 and 43 which move the back support 7 through the operating rod 17 are shown as directly connected by the chain or belt 41 and that the sprockets 53 and 59 which move the leg supports 19 and 20 through the operating rod 25 are shown connected through idler sprockets 56 and 58 and two belts or chains 55 and 60. The idler sprockets 56 and 58 are shown to bring out a construction which may be utilized to operate the rod 25 in the event that obstructions prevent the placing of the large sprocket 56 directly upon the operating rod 25. The idler sprockets 56 and 58 may be omitted where desired and the sprocket 53 directly connected with the sprocket 59 on the operating rod 25.

When current is supplied to the motor 31 from a suitable power source, by closing the "up" side of a switch S, the motor will rotate in one direction and may be selectively connected with either the back or leg supports to raise them. When it is desired to lower the back and leg supports the current through the motor 31 is reversed by moving the switch S to the "down" position. The motor 31 will then rotate in an opposite direction and the yokes may be moved to selectively engage the clutch faces for lowering either the back or leg supports. The switch S is preferably atached to a drop cord so that it may be placed in any convenient position for operation by a patient. Any suitable type of switch may be utilized. The operation of the switch S and the motor 31 will be more fully brought out in connection with the description of the wiring diagram illustrated in Fig. 6.

The yokes 46 and 46a for moving the clutches which connect either the back or leg supports with the motor 31 to raise or lower them, are connected with a hand lever 65, preferably located adjacent the head end of the bed so that it is within easy reach of a patient. The yokes and hand lever may be connected by a lever 67, pivotally secured intermediate its ends to a mounting post 68, and a rod 70. The hand lever 65 is secured intermediate its ends to a pivot 71 on the bed frame. Moving the hand lever 65 about the

pivot 71 pushes or pulls the rod 70, depending upon the direction the hand lever 65 is moved. This is operative to swing the connecting lever 67 about the mounting post 68 and selectively connect either the clutch for moving the back support or the clutch for moving the leg support. The free end 73 of the connecting lever 67 is attached to the toggle or arm of a double-throw, three-pole switch 74 mounted on or adjacent to the motor 31.

The switch 74 is operative to connect into the motor circuit suitable limit switches which are adapted to prevent excessive upward and downward movement of the back and leg supports. For example, when the yokes are moved to connect the clutch members 37 and 38 with the motor 31 to operate the back support 7, the contacts of the switch 74 are simultaneously connected so as to put into the motor circuit the limit switches L1 and L2 (Fig. 6). When the back rest has reached an extreme upper position it is desirable that the motor circuit be automatically interrupted to stop the operation of the motor 31; the limit switch L2 performs this function. A similar feature is desirable when the head rest reaches an extreme lower position; the limit switch L1 performs this function. The lower end of the back rest 7 is preferably provided with a projection or extension 76 which is adapted to move into contact with and operate the limit switches L1 and L2 for cutting off the motor 31. Limit switches L3 and L4 are adapted to be similarly operated by a projection 78 on the leg supporting member 19, to stop the operation of the motor 31 when the leg support reaches an extreme upper or lower position.

In Fig. 5 there is illustrated a modified form of the invention which utilizes gears and connecting shafts instead of sprockets as the connecting means between the motor 31 and operating rods 17 and 25. The clutches, yokes, and other mechanism are constructed and operate similarly to the preferred embodiment. For example, in the modified form of the invention, the sprocket 53 is replaced by a bevel gear 79 that meshes with a bevel gear 80 mounted on a connecting rod 82. The other end of the connecting rod 82 is preferably provided with a bevel gear (not shown) similar to the gear 80 and meshes another bevel gear (not shown) mounted on the shaft which turns the operating rod 25. Movement of the yoke 46b along the squared surface 81 of the shaft 35b engages or disengages the clutch members 50b to 52b similarly to the preferred embodiment.

Fig. 6 illustrates a form of wiring diagram that may be used with the present invention. It will first be assumed that the switch S is moved to the right to close the "up" contact, and also that the switch 74 on the motor 31 has been set in position by means of the hand lever 65, to move the back support. Current from a power line 114 will pass through the switch member S2, line 83, limit switch L2 and line 84 to the contact 86 of the three-pole double-throw switch 74. The contacts 86 and 87 of the switch 74 will be connected since the hand lever 65 mounted adjacent the end of the bed has been operated by a patient to connect the motor circuit for moving the back support. From the contact 87 current will pass through line 88 to the motor 31. From the motor 31 current will pass out through line 89, conductor 90 and line 91 to the returning power line 93. As the back support 7 reaches an extreme upper position the projection 76 thereon moves into contact with the limit switch L2 and interrupts the circuit to the motor. This will stop the operation of the motor and the back support will come to rest in its uppermost position.

When it is desired to move the back support downwardly the switch S will be moved to the left to close the "down" contact. In this relation current will pass through the incoming power 114, through the switch member S2, line 94, line 95, limit switch L1, lines 96 and 97 to contact 98. Contacts 98 and 100 will be connected since the switch 74 on the motor has been actuated by the operating arm 65 and connecting lever 67 so as to move the head support. The current will therefore pass from the contact 98 to the contact 100, through line 101 to the motor 31. From the motor 31 current will pass to the returning power line 93 through lines 89, 90 and 91. As the back support reaches its extreme lower position the projection 76 at the lower end thereof will move into contact with the limit switch L1 to interrupt the circuit and stop the operation of motor 31.

The back rest 7 may be stopped at any desired position intermediate its extreme upper and lower positions by moving the switch S to the central position shown in Fig. 6.

When the hand lever 65 is moved by a patient to connect the motor with the leg support so as to raise and lower it, the operating will be as follows. Assume that the switch S is moved to the right to close the "up" contact and connect the circuit for moving the leg support upwardly. In this relation current will pass from the incoming power line 114 through the switch member S2, line 102, limit switch L4 and line 104 to the contact 106. The contacts 106 and 87 will be connected since the hand lever 65 has been operated so as to move the contacts of the switch 74 into position to move the leg support. Current will therefore pass from the contact 106 to the contact 87, through lines 88 and 89, conductor 90 and line 91 to the returning power line 93. As the leg support reaches an extreme upper position the projection 78 thereon will move into contact with the limit switch L4 to interrupt the circuit and stop the motor 31.

When the switch S is moved to the left to close the "down" contact current will pass from the incoming power line 114 through the switch member S2, line 94, line 108, limit switch L3 and line 109 to the contact 110. The contacts 110 and 100 will be connected since the switch 74 on the motor is in position to operate the leg support. Current will therefore pass from the contact 110 to the contact 100, through line 101, the motor 31, and lines 89, 90 and 91 to the returning power line. As the leg support reaches an extreme lower position the projection 78 thereon will move into contact with the limit switch L3 to interrupt the circuit and stop the motor. Moving the switch S to the central position shown in Fig. 6 is effective to stop the motor 31 and the leg support at any position intermediate the extreme upper and lower positions.

It is believed that the operation of the device will be clear from the foregoing description and that a further detailed description of the operation would be superfluous.

It will be seen that the present invention provides a new and improved motor operated hospital bed that is relatively simple in construc-

tion and operation. The motor, speed reducing means, clutches, controlling lever arm and idler sprockets may all be mounted on a single separate base member, and the base member installed with these parts as a unit. The unit may be readily installed in hospital beds during the manufacture thereof or may be easily installed in existing hospital beds to convert them to motor operation. The device is a boon to all users of hospital beds for with it the back and leg supports may be operated by a patient himself without getting out of bed.

As various changes may be made in the form, construction and arrangement of the parts herein without departing from the spirit and scope of the invention and without sacrificing any of its advantages, it is to be understood that all matter herein is to be interpreted as illustrative and not in a limiting sense.

Having thus described my invention, I claim:

1. A compact unit for installation on commercial hospital beds which have a shaft for raising and lowering the foot of the bed and a second shaft for raising and lowering the head of the bed, in combination, a member adapted to extend transversely of the hospital bed and adapted to be attached to the sides thereof, a shaft mounted on said member, a device on said third-mentioned shaft adapted to be connected to operate the shaft for raising and lowering the foot of the bed, a second device on said third-mentioned shaft adapted to be connected to operate said shaft for raising and lowering the head of the bed, a reversible motor mounted on said transversely extending member, means including a member adapted to extend to a position adjacent the head of the bed for selectively connecting said motor to either of said devices, an electric cable adapted to extend to the head of the bed, and switch means at the end of the cable for operating said motor in either direction.

2. A compact unit for installation on commercial hospital beds which have a shaft for raising and lowering the foot of the bed and another shaft for raising and lowering the head of the bed, in combination, a member adapted to be secured to a hospital bed, a shaft mounted on said member, a device on said third-mentioned shaft adapted to be connected to operate the shaft for raising and lowering the foot of the bed, a second device on said third-mentioned shaft adapted to be connected to operate the shaft for raising and lowering the head of the bed, a reversible motor mounted on said above-mentioned member, means including a member adapted to extend to a position adjacent the head of the bed for selectively connecting said motor to either of said devices, electric connections adapted to extend to the head of the bed, switch means at the head of the bed in said electric connections for operating said motor in either direction, and switches effective upon the motor circuit adapted to be mounted on the bed and to be responsive to the position of the foot and the head of the bed to stop the motor when either the foot or the head of the bed has reached a predetermined upper or lower position.

JOHN W. BUTTIKOFER.

CERTIFICATE OF CORRECTION.

Patent No. 2,349,701. May 23, 1944.

JOHN W. BUTTIKOFER.

It is hereby certified that error appears in the above numbered patent requiring correction as follows: In the heading to the drawings, name of inventor, for "J. W. BUTTIKOFER ET AL" read --J. W. BUTTIKOFER--; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 25th day of July, A. D. 1944.

Leslie Frazer

(Seal) Acting Commissioner of Patents.