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[54] **CONTROL SYSTEM FOR HOSPITAL BED**

[72] Inventor: **Floyd F. Mueller,** Two Rivers, Wis.

[73] Assignee: **American Hospital Supply Corporation,** Evanston, Ill.

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[51] **Int. Cl.**.....**H02p 3/00**

[58] **Field of Search** 318/547, 548, 544; 307/113, 307/115, 142

[56] **References Cited**

UNITED STATES PATENTS

2,621,037	12/1952	Riedel	318/548 X
3,218,531	11/1965	Smith et al.	318/547 X

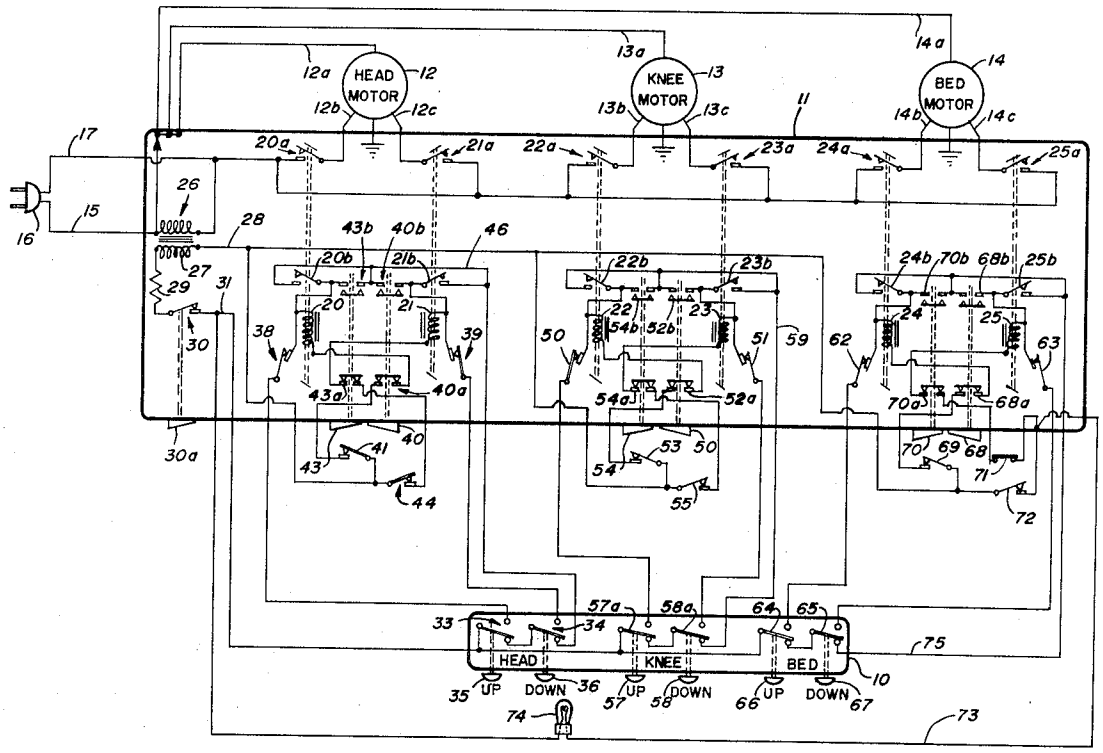
Primary Examiner—Benjamin Dobeck

Attorney—Dawson, Tilton, Fallon & Lungmus

[57] **ABSTRACT**

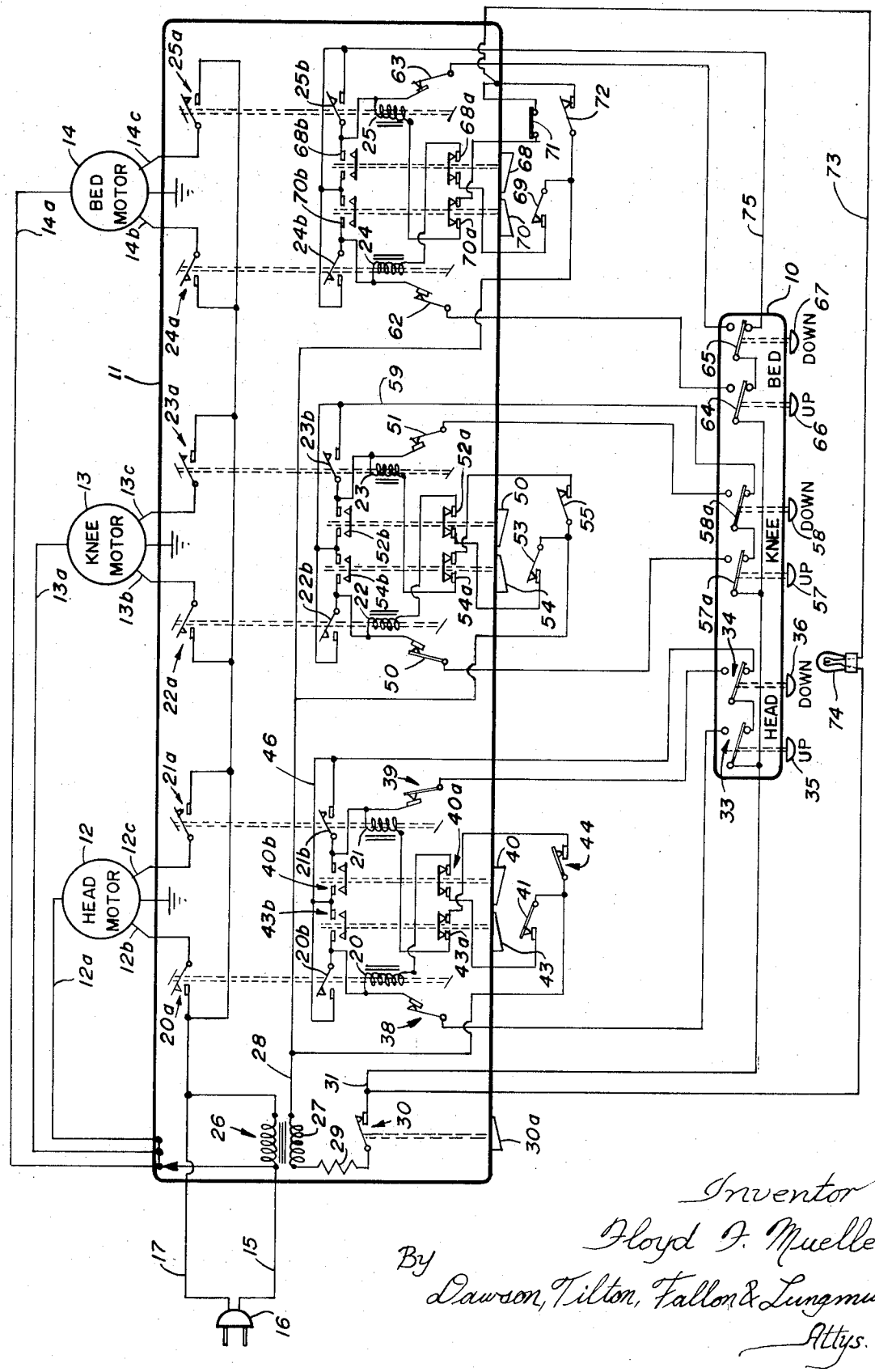
A control system for a hospital bed includes circuitry for selectively energizing an electrical motor for each function desired to be performed. There is a control panel at the footboard of the bed for use by a nurse or other attendant and a pendant for use by the occupant of the bed. There is a forward and reverse position for each motor, and the circuit connections permit independent control at the footboard panel which may be interrupted by action taken at the pendant. Control of functions at the pendant are of the momentary contact type, and it ceases when the occupant releases a switch. Adjustment of the bed at the footboard, however, continues until a limit position is reached or the occupant intervenes or the nurse actuates a stop or cancel switch. The pendant has priority of control, but the nurse may actuate a switch which locks out control by the occupant yet permits the occupant to maintain ability to interrupt control at the footboard. A level sensitive switch is used to place the bed in a predetermined incline to achieve a Trendelenburg position.

12 Claims, 1 Drawing Figure



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Inventor
Floyd F. Mueller
By
Dawson, Tilton, Fallon & Lungmus
Attys.

CONTROL SYSTEM FOR HOSPITAL BED

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to control systems for hospital beds wherein the various bed positions are controlled through electric motors. Power-operated hospital beds normally have a sectionalized mattress support (whether a spring support or flat panels) wherein the sections are articulated for independently controlling a head panel to raise and lower the occupant's head, leg panels which raise and lower the occupant's knees, and some means for adjusting the height of the bed relative to the floor. Further, most such beds are adapted so that the entire mattress support panel can be tilted about a transverse horizontal axis to achieve a Trendelenburg position for treatment of patients with certain heart conditions wherein the head of the occupant is positioned below the level of his heart and his feet are raised above that level.

2. Known Systems

Control systems are known for permitting independent control of the motor which raises and lowers the bed, the motor which raises and lowers the foot panel and the motor which raises and lowers the knee crease. There have been suggestions for having two separate sets of controls – one for a nurse or other attendant located on the footboard of the bed, and the other for control by the occupant or patient. The occupant's control usually is in the form of a pendant which houses the various switches required for his control and which communicates to the footboard panel by means of a flexible cord in which the various wires connected to the pendant are located.

In systems having both an attendant's control panel at the footboard and an occupant's control pendant, it has become desirable to provide mechanisms in which the attendant may inhibit or lock out selective operations of the pendant thereby removing control of certain ones or all of the bed functions by the occupant. Systems using electrical or mechanical interlocks for blocking out the occupant's manual control by an attendant include conventional mechanical mechanisms for preventing the displacement of a switch as well as electrical inhibiting circuitry which prevents the transmission of a control signal from the pendant to its associated power motor.

SUMMARY OF THE INVENTION

In the present invention, there is control circuitry for selectively energizing any of the various electrical motors to perform a desired function, such as raise or lower the bed, raise or lower the head panel, or raise the knee crease. Further, there is a control panel at the footboard of the bed for use by an attendant as well as a pendant for use by the occupant of the bed. During normal use, the pendant has priority of control: that is, if an attendant is controlling the functions of the bed at the footboard, the occupant may interrupt any such control and himself assume control of the bed functions.

The present invention also includes circuitry for inhibiting control of selected ones or all of the bed functions by the occupant; however, even though the occupant cannot control the movements of the bed during this lockout, he may nevertheless inhibit control of those movements by an attendant at the footboard. That is to say, the present system permits a doctor or nurse to inhibit actuation of any or all of the drive motors by the occupant, but the occupant retains priority of control to the extent that he may inhibit control movements by a person manipulating the footboard panel. Thus, the system may be set up so that the occupant may not alter the disposition of the various elements of the bed, but he can also inhibit any such alteration by another person if he desires.

A level sensitive switch attached to the bed senses when the bed mattress support is tilted to assume a Trendelenburg position; and this switch is arranged to provide the proper Trendelenburg position automatically.

Other features and advantages of the present invention will be apparent to persons skilled in the art from the following detailed description of a preferred embodiment accompanied by the attached drawing wherein identical reference numerals will refer to like parts in the various views.

THE DRAWING

The drawing is a schematic diagram showing circuit elements, mechanical switch interconnections, and the separation of elements between the pendant and the footboard control panel.

DETAILED DESCRIPTION

The control system of the present invention has particular utility in controlling the various functions of the bed structure disclosed in a copending, co-owned application of Turko and Mueller for "Invalid Bed Construction," Ser. No. 49,672, filed June 25, 1970.

Turning then to the drawing the elements of the control system normally located at the pendant which is within the reach of the occupant of the bed are enclosed within the heavy solid line **10**, and those elements which are located at the footboard control panel which is within the control of a nurse or other attendant are enclosed within the heavy solid line **11**. The system includes a head motor **12** for controlling the raising and lowering of the head panel in an articulated mattress support frame, a knee motor **13** for raising and lowering the knee crease between an articulated thigh panel and lower leg panel, and a "bed" motor **14** for raising and lowering the entire mattress support frame including an occupant of the bed, if any. Each of the motors **12-14** comes to a stop almost immediately when power is removed because they are connected to their associated loads through gear trains. Thus, the reversing lead may be energized immediately after the other power load is de-energized. Each of the motors **12–14** has an input power lead and these are designated respectively **12*a***, **13*a*** and **14*a***. The frame of each of the motors **12–14** is grounded, and each motor further has a forward power lead (designated **12*b*–14*b*** respectively) and a reverse power lead (designated **12*c*–14*c*** respectively).

The leads **12*a***, **13*a*** and **14*a*** are connected in common to an input power lead **15** received from a conventional plug **16** adapted to fit into a 60-cycle, 120 volt ac receptacle. A second power lead connected to the plug **16** is designated by reference numeral **17** and it is adapted, according to the circuit arrangement

described herein, to be selectively connected to either the forward or reverse input power terminal of the motors 12–14. Thus, there are six normally open relay contacts designated respectively 20*a*, 21*a*, 22*a*, 23*a*, 24*a* and 25*a* having one contact connected to the power line 17 and a second contact connected respectively to the motor input power terminals 12*b*, 12*c*, 13*b*, 13*c*, 14*b*, and 14*c*. The normally open contacts 20*a*–25 are actuated respectively by relays whose coils are designated respectively 20, 21, 22, 23, 24 and 25. Associated with each of the relay coils 20–25 is a second set of normally open contacts, and these are designated respectively 20*b*–25*b*.

All of the elements within the pendant 10 and the footboard control panel 11 (except for the power contacts 20*a*–25*a*) are operated on six volts, and this is received from a transformer generally designated by reference numeral 26 having a primary winding connected across the power lines 15, 16 and a secondary winding designated 27. One terminal of the secondary winding 27 of transformer 26 is directly connected to a line 28, and the other terminal is connected through a resistor 29 and a normally-closed switch 30 to a line 31. The switch 30 is mechanically actuated by means of a push button 30a which will open the switch 30 only so long as the button 30a is depressed. The switch 30 has two main functions. The first is to terminate operation of all of the control circuitry from the footboard panel. Secondly, it breaks any circuits that may have been established from the pendant. The footboard operations are cancelled and must be re-initiated to effect an operation of the bed, but the pendant operation is only interrupted. If a patient continues to press a pendant switch, a circuit will be established when the switch 30 is released.

Turning now to the circuitry which controls the motor 12 which raises and lowers the head panel, there are two switches 33 and 34 located at the pendant 10 and actuated respectively by push buttons 35 and 36. The switches 33 and 34 are two-position switches having a movable contact, a normally closed contact and an open contact. These switches are of the momentary contact type wherein the associated push button must remain in a depressed state or the switch will reverse to its original position, as shown in the drawing. The removable contact of switch 33 is connected to the line 31 by means of a wire fed through a flexible cord from the footboard panel to the pendant. The normally closed contact of the switch 33 is connected to the movable contact of the switch 34. The normally open contact of the switch 33 is coupled through a normally closed switch 38 in the footboard panel to one terminal of the relay coil 20. Similarly, the normally open contact of switch 34 is connected through a normally closed switch 39 to one terminal of the relay coil 21. The switches 38 and 39 are sometimes referred to as the lock out switches, and it is their function to lock out control of the pendant over actuation of the motor 12, although the occupant of the bed still retains control to inhibit operation of the motor 12 by an attendant at the footboard.

The other terminal of the relay coil 20 is connected through a set of normally closed switch contacts 40*a* and a normally closed limit switch 41 to the line 28 connected to the secondary winding 27 of transformer 26. The limit switch 41 is associated with the bed, and it opens when the head panel of the bed is raised to a predetermined limit. Similarly, the other terminal of relay coil 21 is connected through a set of normally closed switch contacts 43*a* and a normally closed limit switch 44 to the line 28. The limit switch 44 opens when the head panel is lowered to a predetermined, horizontal position. The switches 40*a* and 43*a* are actuated respectively by push buttons 40 and 43, and associated with each of these switches is another set of normally closed contacts designated respectively 40*b* and 43*b*. Thus, for example, when the push button 40 is depressed, the contacts 40*a* open immediately and shortly thereafter the contacts 40*b* close. The push buttons 40 and 43 may be arranged so that they toggle about a center line whereby only one push button at a time may activate its associated switches.

The common junction of the coil 20 and switch 38 is connected to the common junction of the switches 43*b* and 20*b*. Similarly, the common junction of the relay coil 21 and switch 39 is directly connected to the common junction between the switches 21*b* and 40*b*. The common junction between the switches 40*b* and 43*b* is connected to a line 46 which, in turn, is connected to the contacts of switches 20*b* and 21*b* as illustrated and also to the normally closed contact of the switch 34 in the pendant 10.

The control circuitry for the knee motor 13 is similar to that just described for the head motor 12, and in addition to the relay coils 22 and 23 and their associated contacts, there are first and second lock out switches 50 and 51 connected respectively to one terminal of those coils. The other terminal of relay coil 22 is connected through a set of normally closed contacts 52*a* and a normally closed limit switch 53 to the line 28. The other terminal of relay coil 23 is connected through a set of normally closed contacts 54*a* and a normally closed limit switch 55 to the line 28. The contacts 52*a* are controlled by a push button 50 which also controls a set of normally open contacts 52*b*. Similarly, the contacts 54*a* are controlled by a push button 54 which also controls a set of normally open contacts 54*b*.

The limit switch 53 is connected to one of the leg panels and it is desired to open when that panel reaches a predetermined upper position; whereas, the limit switch 55 may be connected to the frame and it is adapted to open when the leg panels reach a lower (horizontal) position.

There are two push buttons, designated 57 and 58 in the pendant 10 for initiating the forward and reverse direction of the knee motor 13, and each of these is associated with a two-position switch designated respectively 57*a* and 58*a*. The circuit connections for the control circuitry associated with the knee motor, as already mentioned, is similar in structure and operation to that disclosed in connection with the head motor. It will be observed that a line interconnects the line 31 through the two normally closed positions of the switches 57a and 58a to the common junction between the switches 52*6* and 54b as well as to the switches 22b and 23b. Further, the relay coil 22 is connected in series with the normally closed switches 52a and the limit switch 53 whereas the relay coil 22 is connected in series with the normally closed switch 54a and normally closed limit switch 55.

The control circuitry associated with the bed motor **14** is similar, though not identical, to that which has been disclosed in connection with the control of the head motor **12**. This circuitry is shown to the right of the drawing, and it includes the previously-mentioned relay coils **24** and **25** and their associated switches (**24***a*, **24***b*, **25***a* and **25***b*). Each coil is connected by means of a normally closed lock out switch (**62** and **63**) to normally open positions of the switches **64** and **65** respectively. The switches **64** and **65** are located in the pendant **10** and each is similar to the previously-described switches **33** and **34**, being controlled respectively by push buttons **66** and **67**. The normally closed terminal of switch **65** is connected via line **75** to one contact each of switches **24** and **25***b*, the other contacts of which are connected respectively to the previously-mentioned terminals of coils **24** and **25**.

The other terminal of the coil **24** is connected in series with a set of normally closed contacts **68***a* and a normally closed limit switch **69** to the line **28**; and the other terminal of the relay coil **25** is connected through a normally closed switch **70**, a normally closed level-sensitive switch **71** and a normally closed limit switch **72** to the line **28**. The junction between the switches **71** and **72** is directly connected by means of a line **73** and the filament of a lamp **74** to the line **31**. The level sensitive switch **71** may be a conventional mercury switch attached to the main mattress support frame of the bed which opens when the bed is tilted head down and feet up (the Trendelenburg position) to a predetermined incline.

Associated with the contacts **68**a and **70**a are two push buttons **68** and **70**, and these also control respectively the normally open contacts **68**b and **70**b. The limit switches **69** and **72** are opened when the bed is respectively in its uppermost and lowermost positions. If the bed is to be operated without the pendant, the pendant can be disconnected from the line by means of a disconnect socket; and a plug put into the control socket to complete the circuit from lead **31** to leads **46**, **59** and **75**.

Except for the insertion of the Trendelenburg position sensing switch **71** and the lamp **74**, the control circuitry associated with the bed motor **14** is similar to that provided for controlling the head motor **12**, the operation of which will now be discussed.

OPERATION

When an attendant desires to raise the head panel, he depressed the push button **43** which opens the contacts **43***a* to deenergize relay coil **21** if the head panel was being lowered when the push button **43** was depressed, and closes the contacts **43***b*. The closing of the contacts **43***b* completes a circuit from the power line **28** through the limit switch **41** and normally closed contacts **40**a to energize the relay coil **20**. It will be observed that this energizing circuit is completed through the normally closed positions of the switches **33** and **34** in the pendant **10**. Thus, the operation or energization of the relay coil **20** is dependent upon the fact that these latter two switches are closed.

When the relay coil **20** is energized contacts **20**b are closed to hold the relay coil in an energized state by shorting out the normally open contacts **43***b*. Secondly, the relay associated with coil **20** closes contacts **20***a* and thereby couples the motor power terminal **12***b* to the power line **17**. Since the motor power line **12***a* is already connected to the input power line **15**, the motor **12** will be driven in a forward direction. Because of the holding action of the contacts **20***b*, the motor **12** will be continued in a forward direction after the push button **43** is released. This energization of the motor **12** will continue until one of the following conditions occurs.

1. The upper limit for the head panel is reached and the limit switch **41** is opened to de-energize the relay coil **20**;
2. The attendant depresses push button **40** indicating a desire to lower the head panel (which action will de-energize relay coil **20** by opening contacts **40***a*);
3. The attendant pushes the stop or cancel button **30***a* to open the contacts **30** and thereby de-energize the coil **20**; or
4. The occupant of the bed depresses either the push button **35** or the push button **36** which breaks the circuit to the relay coil **20**.

The lowering of the head panel, conversely, opens the switch **40***a* and closes the switch **40***b* to complete a circuit through the switches **33**, **34**, **43***a* and **44** to energize the relay coil **21**. This, in turn, closes the contacts **21***b* and **21***a*, the contacts **21***b* acting as holding contacts to retain the relay coil **21** in an energized state, and the contacts **21***a* acting to reverse the direction of the motor **12**.

Turning now to the control of the head motor **12** by means of the pendant **10**, if an occupant of the bed depresses the push button **35**, the first thing that happens is that the movable contact of the switch **33** is displaced from its normally closed contact, and this breaks the circuit to either of the relay coils **20** or **21** if they had been energized because their energization is dependent upon the fact that both switches **33** and **34** are in their normal positions. Next, however, the movable contact engages its normally open position and completes a circuit through the lock out switch **38** to energize the coil **20** through the normally closed switches **40***a* and **41**. The motor **12** is energized as already described through the contacts **20***a* which are closed when the relay coil **20** is energized. The motor **12** continues to operate until one of the following conditions occurs:

1. The limit switch **41** is opened indicating that the head panel has reached the full extent of its travel;
2. The occupant releases the push button **35** thereby returning the switch **33** to its normal position and de-energizing the coil **20**;
3. An attendant or other person depresses the cancel or stop button **30***a* to open the switch **30** and temporarily interrupt the circuit to the coil **20**; or
4. The attendant pushes the button **40** to open the contacts **40***a* and temporarily interrupt the circuit to the coil **20**.

It will be observed that if an attendant pushes the stop or cancel button **30**a and then releases it, the head motor will resume operation in its forward direction as long as the occupant continues to depress the push button **35** until the head panel has run its full extent and the limit switch **38** opens. There is a similar operation with the interruption of pendant control by the push buttons on the footboard control panel. That is to say, the cancel button **30***a* and the control panel

UP/DOWN buttons only interrupt and do not cancel a function originating at the pendant.

Directing attention now to the lock out switches **38, 39** associated with the head motor **12**, when these switches are opened by manual operation of an attendant at the footboard panel, the occupant of the bed is not able to energize either of the coils **20, 21** by means of the switches **33, 34**. The attendant is still able to maintain control over the head motor **12** by means of the footboard control panel switches **40, 43**. However, the occupant does have control to the extent that he can inhibit operation at the footboard panel. For example, supposing that the attendant has depressed the push button **40** to thereby cause the relay coil **21** to be energized and locked in in a manner already described. The occupant may de-energize that coil by pressing either of the switches **33, 34** at the pendant which will interrupt current flow through the line **31**, causing the coil **21** to be de-energized and the contacts **21*b*** to open. Similarly, if the forward control relay coil **20** is energized at the footboard panel while the lock out switches **38, 39** are open, depressing either of the head control push buttons **35, 36** at the pendant will cause that forward control coil to be de-energized and drop out of the circuit. In this connection, it will be observed that it is the opening of the normally closed switch contact of the switches **33, 34** which causes the dropping out of an associated relay coil, not the closing of the normally open contact of those switches.

All of the lock switches **38, 39, 50, 51, 62** and **63** may be mechanically interconnected so as to be opened or closed simultaneously, or the switches may be grouped in pairs, if desired such that an attendant could selectively lock out control of either the head motor, knee motor, or bed motor, or any combination of them.

The operation of the control circuitry associated with the knee motor **13** and the bed motor **14** is substantially the same as that which has just been described, except that in the control circuitry of the bed motor **14**, provision is made for achieving the Trendelenburg position. In order to understand the manner in which the Trendelenburg position is reached, reference is made to the copending application identified earlier.

Briefly, that application discloses an invalid bed having a pair of side scissors linkage mechanisms for raising and lowering an upper patient-support frame relative to a base frame. Movement of the patient-support frame into the Trendelenburg or reverse Trendelenburg positions is achieved by buckling corresponding links in each of the scissors linkage mechanisms. To achieve the Trendelenburg position, the bed is raised to its highest position and the lower ends of the scissors linkage at the foot end of the bed are blocked against movement so that when the bed motor **14** is energized to move the bed down by pushing the button **70**, the scissors frame will buckle and the head section will lower until the level sensitive switch **71** opens when the patient-support frame has achieved a predetermined inclination relative to the horizontal. When switch **71** opens, it breaks the circuit to coil **25**, thereby opening contact **25*a*** and shutting down the bed motor **14**.

Although it is not the case for the bed of the above-identified application, a similar technique could be used to achieve a reverse Trendelenburg position by placing a level sensitive switch in series with relay coil **24**.

The lamp **74** is energized when the light switch **71** is closed, indicative of the fact that the bed is not in its lowermost position. The switch is opened when the bed reaches its lowest level–thus breaking the light circuit. This light serves as a signal, for example, in a darkened room to a nurse or attendant that the bed is not in its lowest position which is normally considered the safest position for most patients especially during the night.

Persons skilled in the art will be able to modify certain of the structure which has been illustrated and to substitute equivalent elements for those which have been disclosed; and it is, therefore, intended that all such modifications and substitutions be covered as they are embraced within the spirit and scope of the appended claims.

I claim:

1. In a system for controlling a motor in a power operated bed, said motor connected to move a section of said bed, the combination comprising: first switch means actuatable by an attendant for connecting a source of electrical energy to energize said motor to move said bed section; second switch means actuatable by an occupant of said bed for connecting said source of electrical energy to energize said motor independently of said first switch means; lock out circuit means connected in circuit with said second switch means and actuatable by an attendant to selectively inhibit operation of said second switch means to energize said motor; and circuit means interconnecting said first switch means and said second switch means whereby said second switch means is capable of inhibiting operation of said first switch means even when said lock out circuit means is actuated to inhibit said second switch means from energizing said motor.

2. The system of claim **1** wherein said system further comprises a footboard control panel at which said first switch means is located; and pendant control means for housing said second switch means.

3. The system of claim **2** wherein said first switch means includes a relay having a coil and normally open contacts connected in series with said motor and said source of power; a push-actuated switch connected in circuit with said coil to energize the same when said push switch is actuated by an attendant; and limit switch means associated with said bed for opening the circuit to said coil when said bed section has reached a predetermined position, said second switch means being connected in circuit with said coil to energize the same when said second switch means is closed independent of the closing of said first switch means.

4. The system of claim **3** wherein said second switch means includes a two-position switch having a movable contact, a normally closed contact and a normally open contact, said system further comprising means interconnecting said normally closed contact with said push switch means for disconnecting said relay coil when said movable contact is disconnected from said normally closed contact of said first switch means, said normally open contact of said first switch means being connected in series circuit with said lock out circuit means and said relay coil to energize said relay coil through said lock out circuit means independently of said first switch means.

5. A control system for a power-operated bed including a reversible motor controlling the movement of said bed section, comprising: attendant control means fixed to said bed including forward switch means actuatable by an attendant for energizing said motor in a forward direction including means for locking in said forward switch means once actuated; reverse switch means for energizing said motor in a reverse direction and including means for locking in said reverse switch means to continually energize said motor once actuated; first limit switch means to de-energize said motor when said bed section reaches a predetermined extent of travel in response to the actuation of said first switch means; second limit switch means for deenergizing said motor when said bed section has reached a second predetermined level of extent of travel in response to the actuation of said reverse switch means; means electrically interconnecting said reverse switch means and said forward switch means whereby the operation of each of these switch means is mutually exclusive of the other; occupant control means including a forward switch for energizing said motor in a forward direction and a reverse switch for energizing said motor in a reverse direction; and lock out switch means for inhibiting the actuation of said forward and reverse switch means at said pendant control means while permitting said pendant control switch means to inhibit the actuation of said control panel forward and reverse switch means.

6. The system of claim 5 wherein each of said forward and reverse switch means of said pendant control means is a two-position switch having a normally closed contact and a normally open contact, said normally closed contacts being interconnected when said forward and reverse switches are in their normal positions and said interconnected positions being connected in series with both of said relay coils whereby both of said relay coils will be de-energized when either of said forward and reverse pendant control means switches is actuated.

7. The system of claim 5 further comprising conductive means for interconnecting the normally open position of each of said forward and reverse switch means of said pendant control means in series with a lock out switch directly to a terminal of an associated relay coil whereby actuation of either of said forward or reverse switches of said pendant control means will vest control of said system in the occupant of said bed provided said lock out switches are closed.

8. A control system for a power-operated bed having a reversible motor for moving a section of the bed between a first and a second limit position comprising: a control panel at the footboard of said bed and including a forward and a reverse switch actuatable by an attendant, each such switch including a set of normally open contacts and a set of normally closed contacts, a first and a second limit switch arranged to open respectively at said first and said second limit positions of said section, a forward and a reverse relay each including a coil and a pair of normally closed contacts; means connecting said sets of normally open contacts of said forward and reverse relays respectively with the forward and reverse terminals of said motor; a pendant control included, a forward and a reverse switch each including a movable contact, a normally closed contact, and a normally open contact; first conductive means for connecting the movable contact and normally closed contact of said pendant forward switch, said normally open contacts of said footboard forward switch, the coil of said forward relay, the normally closed contacts of said footboard reverse switch, and said first limit switch in series across a source of electrical power; second conductive means for connecting the movable contact and said normally closed contact of said pendant reverse switch, said normally open contacts of said footboard reverse switch, the coil of said reverse relay, the normally closed contacts of said footboard forward switch, and said second limit switch in series across said source of power; third conductive means connecting the normally open contacts of said pendant for-ward switch in parallel with the normally open contacts of said footboard forward switch; and fourth conductive means connecting the normally open contacts of said pendant reverse switch in parallel with the normally open contacts of said footboard reverse switch.

9. The system of claim 8 further comprising a first lock out switch connected in series with the normally open contacts of said pendant forward switch to inhibit functioning of the same when said first lock out switch is open and a second lock out switch connected in series with the normally contacts of said pendant reverse switch to inhibit functioning of the same when said second lock out switch is open.

10. The system of claim 8 wherein each of said relays further includes a pair of normally closed contacts connected to hold their associated relay coils energized when the said associated relay is first energized by its associated footboard switch.

11. The system of claim 8 further comprising means connecting the normally closed contacts of said pendant forward and reverse switches in series with each other and interposed between the source and the forward and reverse relays of said footboard panel.

12. The system of claim 8 further comprising a level sensitive switch open when horizontal and closed when tilted to a predetermined degree from the horizontal attached to said bed to sense when the mattress frame is displaced from a horizontal position; and means electrically connecting said level sensitive switch in series with one of said relay coils to inhibit energization of the same when the mattress is displaced from the horizontal.

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