

[54] **SOLID STATE HOSPITAL BED POWER CONTROL UNIT**

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[51] Int. Cl.**H02p 7/74**
[58] Field of Search.....**38/480, 65, 54; 200/159 R; 250/215, 221**

[56] **References Cited**

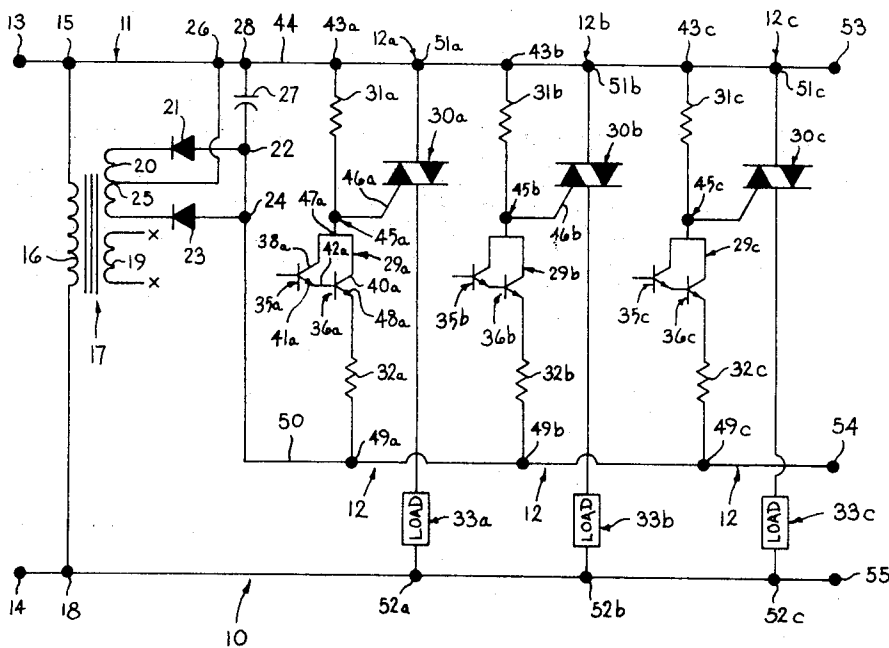
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[57] **ABSTRACT**

An electrical power control unit, preferably for use with hospital bed control handsets, including control circuitry comprising a first portion wherein the primary winding of a control power transformer is connected across AC power, the secondary winding of the transformer is connected to the handset, and the tertiary winding of the transformer is connected in circuit to form a full wave center tapped rectifier, said control circuitry further including one or more other circuit portions each comprising a load, a photo transistor amplifier, a Triac, and a pair of resistors connected in circuit wherein the photo transistor amplifier is activated when light falls upon its sensitive surface and wherein upon activation of the photo transistor the gate of the associated Triac changes polarity thus causing the Triac gate to conduct power to the associated load.

9 Claims, 4 Drawing Figures



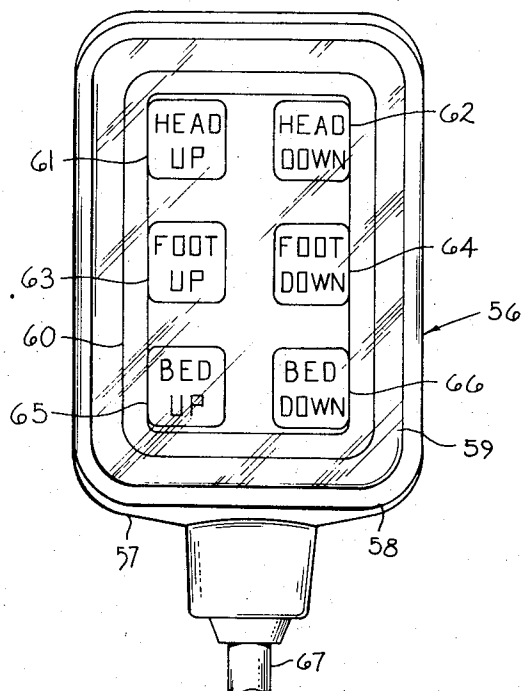


FIG 1

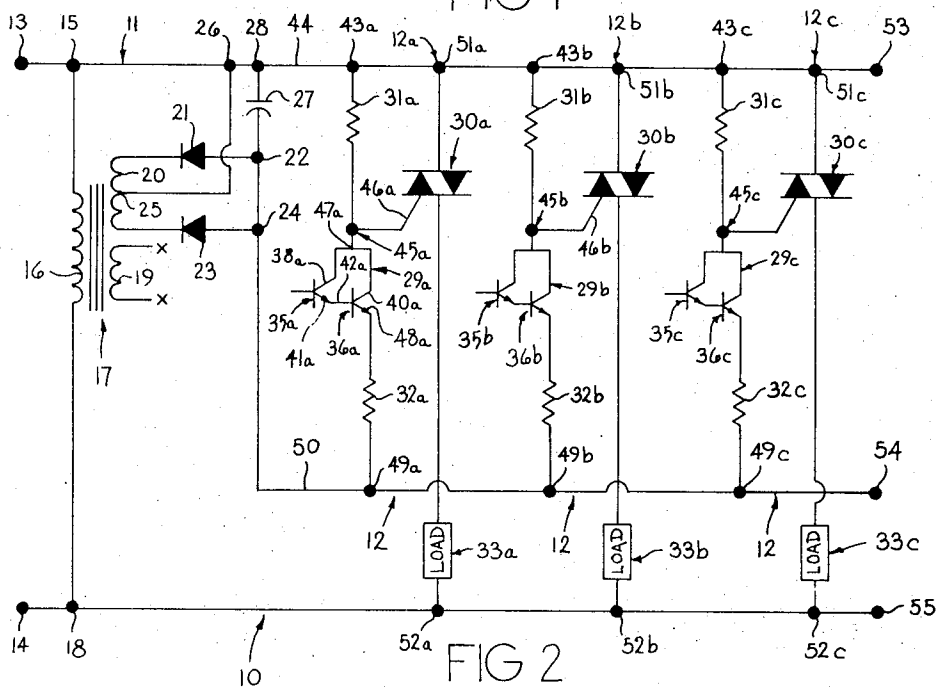


FIG 2

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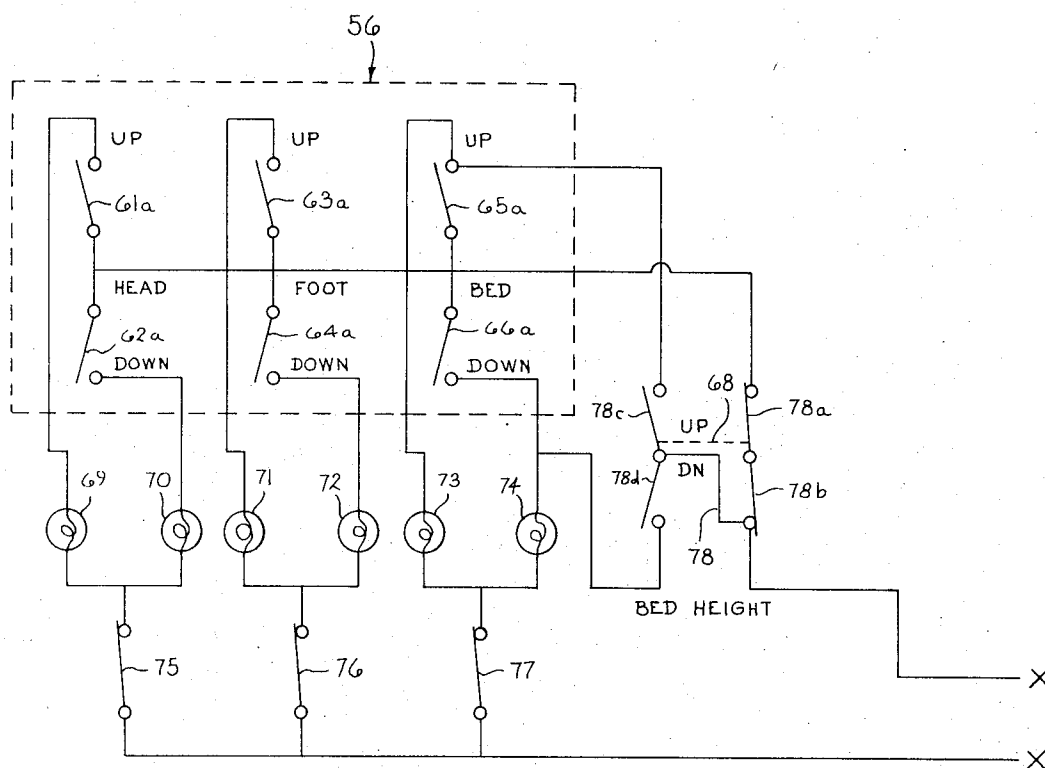


FIG 3

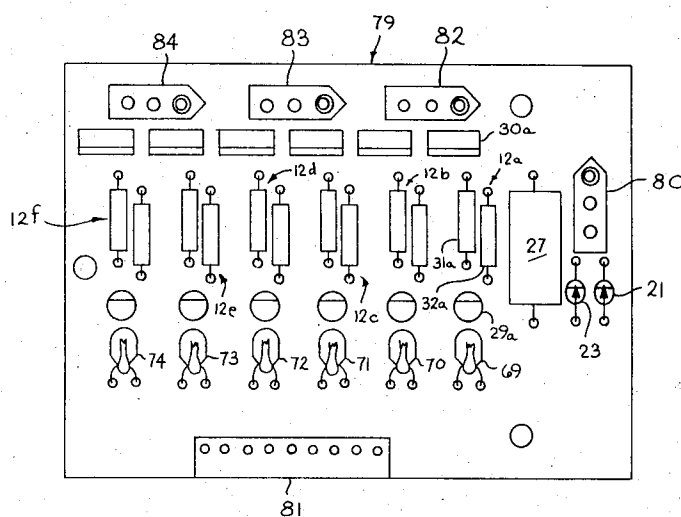


FIG 4

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SOLID STATE HOSPITAL BED POWER CONTROL UNIT

BACKGROUND OF THE INVENTION

1. Field of the Invention

Our invention relates to power control units, and more particularly to an improvement in electrically powered control units of the type employed for operating motorized hospital beds in response to signals imparted to the control unit from a bed control handset.

2. Description of the Prior Art

Motorized hospital beds have been in use for many years now. Most commonly the operation of such beds is controlled by means of a handset capable of being held and operated by a patient occupying the bed. The handset is normally provided with a plurality of some form of independently operable actuators such as buttons, etc. Each of these actuators, i.e., buttons is interconnected through a power control unit preferably to one or more motors whereby a given portion or the entire bed may be raised or lowered as commanded by the patient through his actuation of the appropriate handset button. An exemplary form of such a handset is described and illustrated in U.S. Pat. No. 3,399,287 issued to G. M. Euler and which is assigned to the same assignee as the present invention.

Although there has always existed a requirement that the electrically powered operating control for motorized hospital beds be intrinsically safe, this requirement has assumed more importance with the adoption by hospitals and other similar type institutions of more sophisticated medical instrumentation wherein the patient can be exposed to fatal electric shock. As used herein the phrase "intrinsically safe" is employed to refer to that state of operativeness wherein the operation of any of the controls of the hospital bed while either the handset or the control unit is in an oxygen enriched atmosphere will not cause ignition of flammable material. Accordingly, to be acceptable for use with motorized hospital beds, power control units must necessarily possess the capability of operating in such a manner as to satisfy the aforementioned requirement.

A further characteristic which it is desirable be possessed by power control units utilized for controlling the operation of motorized hospital beds is that the same power control unit be employable with different types of handsets. In this connection, for obvious reasons it is also desirable that the power control unit be compatible with a variety of handsets such as to readily permit interchangeability of handsets at the option of the purchaser of the device at the point of use, as well as to facilitate replacement of the handset should this need arise.

In view of the fact that motorized hospital beds manufactured in past years have been designed such as to be capable of cooperating with power control unit boxes having given dimensions, it is highly desirable that the physical dimensions and mounting means for such boxes employed to house prior art power control units be retained. This is to enable the prior art form of power control unit to be substituted for with no change being necessitated on the part of the bed manufacturer, the handset manufacturer, or the customer insofar as concerns for example the mountings for the power control unit box, the bed adjustments, or electrical wiring.

OBJECTS OF THE INVENTION

It is therefore an object of the present invention to provide a novel and improved power control unit preferably for use with motorized hospital beds which employs solid state components to accomplish power contacting such as to preclude the occurrence of sparking or arcing of contacts.

It is another object of the present invention to provide such a power control unit for use with motorized hospital beds wherein the same power control unit is capable of being utilized with different types of handsets, and which permits continued usage of the presently designed handset with no changes required.

A further object of the present invention is to provide such a power control unit for use with motorized hospital beds wherein the control circuitry comprising the power control unit is capable of being housed in a box having the same physical dimensions and mounting means as prior art control unit boxes.

A still further object of the present invention is to provide such a power control unit for motorized hospital beds which is capable of cooperating with a bed height limit positioning means.

Yet another object of the present invention is to provide such a power control unit for motorized hospital beds which is both easy to install and reliable in operation.

SUMMARY OF THE INVENTION

In accordance with a preferred form of the invention there is provided a power control unit for operating motorized hospital beds in response to signals imparted to the control unit from a bed control handset. The control unit comprises control circuitry including a first portion wherein an AC power source is connected across a pair of input terminals of the circuit at all times. The first portion further includes a control power transformer which has its primary winding connected across the AC power, its secondary winding connected to the handset, and its tertiary winding connected in circuit with a pair of diodes to form a full wave center tapped rectifier. The control circuitry of the power control unit also includes one or more other circuit portions. Each of these latter circuit portions includes a photo transistor amplifier, a Triac, a first resistor connected to the junction of the collector of the photo transistor amplifier and the gate of the Triac, a second resistor connected to the emitter of the photo transistor amplifier, and a load connected between the triac and one of the power lines of the circuit. When there is no light falling upon the sensitive surface of the photo transistor amplifier it is essentially off, therefore it is conducting very little current. When a light source is energized illuminating the sensitive portion of the photo transistor amplifier, it causes conduction to take place between the latter's collector and emitter. When the photo transistor conducts, the junction of the photo transistor amplifier, the aforementioned first resistor and the Triac gate changes electrically from a positive voltage to a negative voltage thus causing the Triac to conduct power to its associated load, the latter preferably comprising one winding of a reversible capacitor split phase motor.

The invention will be more fully understood from the following detailed description and its scope will be pointed out in the appended claims.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a view in front elevation of a hospital bed control handset of a type contemplated to be used with the power control unit for operating motorized hospital beds in accordance with the present invention;

FIG. 2 is a schematic diagram of the control circuitry for the power control unit for operating motorized hospital beds in accordance with the present invention;

FIG. 3 is a schematic representation of the hospital bed control handset and bed height limit positioning means employable in accordance with the present invention with the control circuitry of the power control unit illustrated in FIG. 2; and

FIG. 4 is a view in front elevation of the layout on a printed circuit board of the embodiment of the control circuitry for the power control unit in accordance with the present invention for use with a hospital bed control handset having six actuators.

DESCRIPTION OF A PREFERRED EMBODIMENT

Referring to FIG. 2 of the drawings, there is illustrated therein the control circuitry, generally designated by reference numeral 10, of the power control unit for operating motorized hospital beds in accordance with the present invention. The control circuitry 10 includes a first portion 11 and one or more other portions or sections 12. For purposes of illustration the control circuitry 10 is depicted in FIG. 2 as including three such other sections 12, i.e., sections 12a, 12b and 12c. It is to be understood however that the control circuitry 10 and as such the power control unit may be provided without departing from the essence of the invention with more or fewer sections 12 as dictated for example by the specific application in which it is desired to employ the subject power control unit.

Turning now to a description of the first portion 11 of the control circuitry 10, operating power for the control circuitry 10 of the power control unit is applied across terminals 13 and 14. This power which is applied at all times is preferably from an alternating current (AC) source. As shown in FIG. 2, terminal 13 is connected through terminal 15 to one side of the primary winding 16 of the control power transformer 17 while terminal 14 is connected through terminal 18 to the other side of the primary winding 16 of transformer 17. Transformer 17 is provided with an isolated secondary winding 19 and a tertiary winding 20. The control power transformer 17 has been modified to incorporate a tertiary winding 20 applied on top of the primary winding 16. This tertiary winding 20 is a center tapped coil with the center tap being connected to one lead of the primary winding 16. The secondary winding 19 is designed to have a low energy capability so that any sparks generated in its terminations will be intrinsically safe. Interspaced between the primary and secondary windings 16 and 19, respectively, is an electrostatic or "Faraday" shield (not shown) made of approximately one and a half turns of copper foil properly insulated and bonded by means of a wire lead to the core and frame of the transformer.

The secondary winding 19 which for purposes of illustration is depicted in FIG. 2 of the drawings as terminating at the indices X—X is connected to a hospital bed control handset of the type shown in FIG. 1 in a manner to be more fully described hereinafter. One side of tertiary winding 20 is connected through diode 21 to terminal 22 while the other side of tertiary winding 20 is connected through diode 23 to terminal 24. Tertiary winding 20 is also center tapped at 25 and is connected therefrom through terminal 26 to input terminal 13. Thus, it can be seen that tertiary winding 20 is connected to diodes 21 and 23 and to line power in such a manner as to form a full wave center tapped rectifier. Capacitor 27 which is connected between terminals 24 and 28 is connected across the rectifier and functions to smooth the output voltage.

Each of the other portions of the control circuitry 10 depicted in FIG. 2 of the drawings, i.e., portions 12a, 12b and 12c, respectively, are substantially identical in nature and are treated hereinafter for purposes of describing the invention as each comprising a single control section. Accordingly, it is deemed sufficient for purposes of describing the invention to describe in detail only one such section, i.e., section 12a, with the understanding that sections 12b and 12c are substantially identical to each other and to section 12a. Further, for purposes of identification, the elements contained in each of sections 12b and 12c which find correspondence in section 12a have been identified in the drawings with the same reference numerals as used in section 12a but with the letters b and c being substituted for the letter a depending on whether the element is found in section 12b, or section 12c, respectively.

Referring further to FIG. 2 of drawings, section 12a of the power control unit for operating motorized hospital beds in accordance with the present invention comprises a photo transistor amplifier 29a, a Triac 30a, a first resistor 31a, a second resistor 32a and a load 33a. The photo transistor amplifier 29a comprises a pair of transistors 35a and 36a, respectively, arranged in a so-called "Darlington" configuration. For a detailed description of arranging transistor units in a so-called "Darlington" configuration reference may be had to U.S. Pat. No. 2,663,806. However, for purposes of understanding the construction and mode of operation of section 12a of control circuitry 10 it is deemed sufficient to note that as shown in FIG. 2 the collector 38a of transistor 35a is connected to the collector 40a of transistor 36a. Further it is seen that the emitter 41a of transistor 35a is connected to the base 42a of transistor 36a.

Resistor 31a is connected through terminal 43a to the power line 44, which also is the 12v positive bus by virtue of its being connected to the center of the full wave rectifier above described, and to the junction 45a of the gate 46a of the Triac 30a and the common conductor 47a of the photo transistor amplifier 29a. Resistor 32a is connected to the emitter 48a of transistor 36a and through terminal 49a to line 50. Triac 30a and load 33a are connected in series between line 44 and line 50 through terminals 51a and 52a, respectively.

With regard to the manner in which section 12a functions, when there is no light falling upon the sensitive surface of photo transistor amplifier 29a, the latter

is essentially off and therefore conducts very little current. Further when photo transistor amplifier 29a is not conducting, a positive voltage is impressed on the gate 46a of the Triac 30a inhibiting it from turning on. When a light source is energized however illuminating the sensitive portion of photo transistor amplifier 29a, conduction takes place through the latter. Since resistor 32a is of relatively small ohmic value and is connected between the minus bus of the D.C. power supply and the emitter of the photo transistor amplifier 29a, and further since resistor 31a is of relatively large resistance, when the photo transistor amplifier 29a conducts, the junction 45a of photo transistor amplifier 29a, resistor 31a and the gate 46a of Triac 30a changes electrically from a positive voltage to a negative voltage thus causing the Triac 30a to conduct power to the associated load 33a. In accordance with the preferred embodiment of the invention load 33a would comprise one winding of a reversible capacitor split phase motor.

Similarly sections 12b and 12c each operate as a separate control section to provide power to the loads 33b and 33c, respectively. Section 12b includes the photo transistor amplifier 29b, the Triac 30b, first resistor 31b, second resistor 32b, and the load 33b, and section 12c includes the photo transistor amplifier 29c, the Triac 30c, first resistor 31c, second resistor 32c and the load 33c. In the manner previously set forth hereinabove in connection with the description of the manner of operation of section 12a of control circuitry 10 of the power control unit in accordance with the present invention, when light sources are energized to illuminate the sensitive portion of each of photo transistor amplifiers 29b and 29c, the latter conduct. With the conduction of photo transistor amplifier 29b, the junction 45b of photo transistor amplifier 29b, resistor 31b and the gate 46b of Triac 30b changes electrically from a positive voltage to a negative voltage thus causing the Triac 30b to conduct power to load 33b which in this case may comprise the second or reverse winding of the aforementioned reversible capacitor split phase motor of load 33a. Upon conduction of photo transistor amplifier 29c, the junction 45c likewise changes electrically from a positive voltage to a negative voltage thus causing the Triac 30c to conduct power to load 33c which may comprise a winding of a second reversible capacitor split phase motor. Finally, as mentioned previously one or more other sections 12 substantially identical to the aforescribed sections 12a, 12b and 12c may be added to the control circuitry 10 illustrated in FIG. 2. Suitable connections for such additional other sections 12 may be made to control circuitry 10 at the terminals 53, 54 and 55. Further it is to be understood that for certain applications the control circuitry 10 of the power control unit may include just section 12a, or just sections 12a and 12b. However the more normal situation is that generally the control circuitry 10 would include the portion 11 and up to six sections 12.

In FIG. 1 of the drawings there is illustrated a hospital bed control handset 56 of a type contemplated for use to impart control signals to the control circuitry 10 of the power control unit for operating motorized hospital beds in accordance with the present invention. Inasmuch as the handset 56 is intended to represent merely an exemplary showing of one form of handset

which may be employed with the power control unit in accordance with the present invention and inasmuch as the construction and mode of operation of such handsets 56 is only indirectly related to the subject matter of the present invention, only a brief description of the handset 56 has been set forth hereinafter. As illustrated in FIG. 1, the handset 56 comprises a housing 57 including a receptacle 58 formed in any suitable manner, such as by molding of a plastic material, and having an open side. The housing 57 also includes a seal member 59 preferably formed of a flexible material such as rubber. The member 59 is located within the receptacle 58 and suitable means (not shown) are provided to retain the member 59 therein. If desired, a suitable cement may be applied between the side walls of the member 59 and the adjacent side walls of the receptacle 58 to firmly retain the member 59 within the receptacle 58. The housing 57 is configured and dimensioned so that a person can hold the same and operate the device with one hand.

The outer or exposed surface of operating member 60 mounted within the housing 57 for movement relative thereto includes a plurality of spaced areas which correspond in number to the number of operating positions of the member 60 and which are adapted to have force applied thereto to effect rocking movement of the member 60. Suitable indicia are located adjacent such areas to indicate the particular function performed when force is applied to selected ones of such areas. The indicia can be applied to either the exposed face of the operating member 60 or to the outer surface of seal member 59. In the embodiment illustrated, the indicia are applied to raised buttons 61, 62, 63, 64, 65, and 66 which extend from the exposed surface of the member 60 and to which the operating force is applied. The buttons 61-66 may be formed integrally with the member 60 and carry indicia indicating the particular function which will be performed in response to the application of force to the particular button. For example, pressing the member 59 over the "HEAD DOWN" button 62 results in downward movement of the head section of the motorized bed. In a similar manner, application of force to the member 59 over the "FOOT DOWN" button 64 will result in downward movement of the foot section of the bed. Mechanical interlock means (not shown) are provided in the handset 56 to permit only one operation of the motorized bed to occur at a time. Wiring for the handset 56 is contained in a flexible cord 67 which extends through an opening in the side of the receptacle 58.

As noted hereinabove, by virtue of the inclusion in the handset 56 of mechanical interlocking means only one operation of the motorized bed at a time is possible. Accordingly there is no need to provide the control circuitry 10 with a function inhibiting network. However, in case such a network were required, steering diodes may be added between each of the sections 12 insuring that a positive voltage is present at all the Triac gates except the one desired to be fired. These diodes may be connected to the open base termination of the photo transistor amplifier in suitable fashion to inhibit the photo transistor amplifier from conducting except when first energized by its associated light source.

Referring now to FIG. 3 of the drawings, the handset 56 is schematically illustrated connected in circuit with

a bed height limit positioning means 68, all of which in turn is connected to the secondary winding 19 of control power transformer 17. For purposes of illustration, the circuit of FIG. 3 is shown terminating at the indices X—X which are the same indices X—X illustrated in FIG. 2 previously described hereinabove. As depicted in FIG. 3, handset 56 includes six normally open switches corresponding to the six buttons 61–66 described previously. For purposes of identification these six switches are denoted by the same reference numerals employed to designate the buttons of the handset but with the letter a added thereto. Thus, for example, switch 61a is associated with "HEAD UP" button 61, switch 63a is associated with "FOOT UP" button 63, etc.

With further reference to FIG. 3, switch 61a is connected in series with a light source 69 which in accordance with the preferred embodiment of the invention comprises a light bulb. Similarly switch 62a is connected in series with light source 70, and switches 63a, 64a, 65a and 66a are each connected in series with a light source 71, 72, 73 and 74, respectively. As seen with reference to FIG. 5, a normally closed cut-off switch 75, 76 and 77 is associated with each pair of switches 61a and 62a, 63a and 64a, and 65a and 66a, respectively. The function of these cut-off switches 75, 76 and 77 will be described in more detail hereinafter.

Bed height limit positioning means 68 comprises a manually actuatable switch 78 including a pair of normally closed switch portions 78a, 78b and a pair of normally open switch portions 78c, 78d. In accordance with conventional practice, the manually actuating portion (not shown) of the switch 78 is positioned in a suitable panel normally located at the foot of the motorized hospital bed out of the reach of the patient occupying the bed. The switch 78 enables the motorized bed to be raised or lowered under the control of the nurse, or other personnel attending the patient occupying the bed. Normally open switch portions 78c and 78d function to provide upper and lower bed height limit means whereby the travel of the bed in an upper or lower direction is limited. For example, by manually actuating switch 78 such as to cause normally open switch portion 78c to close, the bed will be made to rise. The bed will continue to rise until such time as either the actuating force is removed from switch 78 enabling switch portion 78c to return to its normally open position or until the upper limit of travel of the bed as determined by switch portion 78a is reached. Likewise, the bed is lowered under control of the nurse, etc. as a result of actuating switch 78, to cause normally open switch portion 78d to move to a closed position. It should be noted that the circuitry is such that when the bed is being raised or lowered by means of switch 78 under the control of the nurse, the switches of the handset 56 are rendered inoperative thereby preventing the patient from overriding through use of the handset 56 movement of the bed in the direction desired by the nurse.

Turning now to a fuller description of the cut-off switches 75, 76 and 77, these cut-off switches generally are associated with manually actuating means (not shown) housed within the same panel at the foot of the bed as the manually actuating means for switch 78. Each of these cut-off switches 75, 76 and 77 functions

as an inhibit means preventing the head, foot, or entire bed, respectively, from being raised or lowered by the patient through use of the handset 56. Thus, for example, where the patient in the bed is in traction, conceivably it might be desired to keep the foot of the bed raised. Accordingly, once the foot of the bed has been raised to the desired height, the nurse by manually actuating cut-off switch 76 can cause the latter to move to an open circuit position. With the cut-off switch 76 in an open circuit condition, it is readily apparent that were the patient to push button 63 or button 64 of the handset to cause either switch 63a or switch 64a to move to a closed circuit position, the circuit of FIG. 3 terminating at indices X—X including cut-off switch 76, and switch 63a and switch 64a nevertheless remains open. Cut-off switches 75 and 77, respectively, function similarly when in an open circuit condition to preclude movement of the head portion of the bed through operation of switches 61a and 62a of the handset 56, and to preclude movement of the entire bed through operation of the switches 65a and 66a of the handset 56.

In accordance with the preferred embodiment of the invention, the control circuitry 10 of the power control unit for operating motorized hospital beds is preferably placed on a printed circuit board 79 as depicted in FIG. 4 of the drawing. For purposes of illustration, the control circuitry 10 mounted on the board 79 includes six sections 12a–12f, and is intended to cooperate with a six button handset of the type illustrated in FIG. 1. In such an embodiment one of the sections 12a–12f is associated with one of the handset buttons. As shown in FIG. 4, board 79 also supports five connectors 80, 81, 82, 83 and 84. Connector 80 is employed to connect input power to the board 79. Connector 81 serves as a means to connect the handset 56 to the board 79. Finally, connectors 82, 83 and 84 provide a means of interconnecting the board 79 to three separate reversible capacitor split phase motors (not shown). More specifically, connector 82 connects the board 79 and therethrough sections 12a and 12b of control circuitry 10 to the motor which operates to either raise or lower portion of the head. Connector 83 connects the board 79 and therethrough sections 12c and 12d of control circuitry 10 to the motor which operates to either raise or lower the foot portion of the bed. Finally, connector 84 connects the board 79 and therethrough sections 12e and 12f of control circuit 10 to the motor which operates to move the entire bed up or down.

Turning now to a description of the manner of operation of the power control unit in accordance with the present invention, it is seen with reference to FIGS. 2, 3 and 4 that with cut-off switches 75, 76 and 77 in their normally closed position and with switch 78 in the position illustrated in FIG. 3, should the patient push button 61 of handset 56 causing switch 61a to close this will complete the circuit through light source 69, causing the latter to illuminate. Light source 69 when energized will, by virtue of its being positioned adjacent photo transistor amplifier 29a as best seen with reference to FIG. 4, illuminate the sensitive portion of photo transistor amplifier 29a. This causes conduction to take place through the photo transistor amplifier 29a. Since resistor 32a is of small ohmic value and is connected between the minus bus of the D.C. power

supply and photo transistor amplifier, and further since resistor 31a is of relatively large resistance, when the photo transistor amplifier 29a conducts, the junction 45a changes electrically from a positive voltage to a negative voltage thus causing the Triac 30a to conduct power to its associated load 33a. This power is conducted through connector 82 to load 33a which comprises the forward winding of a first reversible capacitor split phase motor such that the latter motor is operated to cause the bed to rise. Actuation of any of the other buttons of the handset 56 similarly would result in the energization of the light source associated with the photo transistor amplifiers in one of the other sections of the control circuitry causing the given photo transistor amplifier to conduct with the result that the Triac associated therewith would conduct power to a given winding of a motor which when operated moves either the entire bed or a portion thereof in the desired manner. Although not shown in FIG. 4 of the drawings it is to be understood that the light sources 69-74 are provided with suitable shielding to visually isolate each of the light sources from all of the other photo transistor amplifiers mounted on the board 79 except for the one to which a given light source is intended to be optically coupled.

Thus, in accordance with the present invention there has been provided a novel and improved power control unit preferably for use with motorized hospital beds which employs solid state components to accomplish power contacting such as to preclude the occurrence of sparking or arcing of contacts. Further in accordance with the present invention the same power control unit is capable of being utilized with different types of handsets. In addition the power control unit of the present invention permits continued usage of the presently designed handset with no changes required in the latter. Moreover the control circuitry of the power control unit is capable of being housed in a box having the same physical dimensions and mounting means as prior art control unit boxes. Also the subject power control unit is capable of cooperating with a bed height limit positioning means. Finally, the power control unit of the instant invention is both easy to install and reliable in operation.

While only two embodiments of our invention have been shown, it will be appreciated that many modifications thereof may readily be made by those skilled in the art. For example as mentioned previously hereinabove, if so desired the control circuitry 10 of the power control unit may be provided without departing from the essence of the invention with more or fewer sections 12 each intended to function as a separate control section.

What we claim as new and desire to secure by Letters Patent of the United States is:

1. A power control unit preferably for operating a motorized bed in response to signals imparted to said control unit from a bed control handset comprising:

- a. control circuitry including at least one portion;
- b. said at least one portion of said control circuitry comprising a photo transistor having a collector and an emitter, a Triac having a gate, a first resistor, a second resistor, and a load connected in circuit with said Triac, said collector of said photo transistor and said gate of said Triac being con-

nected to said first resistor at a junction in said circuit, and said second resistor being connected to the emitter of said photo transistor; and

c. said photo transistor further including a sensitive surface wherein when no signal is imparted to said sensitive surface from said bed control handset said photo transistor conducts very little current and is essentially OFF, and wherein when said sensitive surface of said photo transistor receives a signal from said bed control handset said photo transistor conducts and said junction in said circuit changes electrically from a first voltage to a second voltage causing said Triac to conduct power to said load.

2. A power control unit for operating a motorized bed as set forth in claim 1 wherein said load comprises a first winding of a reversible capacitor split phase motor.

3. A power control unit preferably for operating a motorized bed in response to signals imparted to said control unit from a bed control handset comprising:

- a. control circuitry including a first portion and a plurality of second portions;
- b. said first portion of said control circuitry including a pair of input terminals for connection to a power source, and a control power transformer;
- c. said control power transformer comprising a primary winding, a secondary winding and a tertiary winding;
- d. said primary winding of said control power transformer being connected to said pair of input terminals and across said power source;
- e. said secondary winding of said control power transformer being connected to said bed control handset;
- f. said tertiary winding of said control power transformer being connected to said plurality of second portions to connect in circuit said first portion and said plurality of second portions;
- g. said plurality of second portions each comprising a photo transistor having a collector and an emitter, a Triac having a gate, a first resistor, a second resistor, and a load connected in circuit with said Triac, said collector of said photo transistor and said gate of said Triac being connected to said first resistor at a junction in said circuit, and said second resistor being connected to said emitter of said photo transistor; and

h. said photo transistor of each of said plurality of second portions further including a sensitive surface wherein when no signal is imparted to said sensitive surface from said bed control handset said photo transistor conducts very little current and is essentially OFF, and wherein when said sensitive surface of said photo transistor receives a signal from said bed control handset said photo transistor conducts and said junction in said circuit changes electrically from a first voltage to a second voltage causing said Triac to conduct power to said load.

4. A power control unit for operating a motorized bed as set forth in claim 3 wherein:

- a. said power source comprises an AC power source and is connected at all times to said pair of input terminals;

- b. means are connected in circuit with said tertiary winding of said control power transformer to form a full wave center tapped rectifier, said means comprise first and second diodes connected to the extremities of said tertiary winding and a tap connected at the center of said tertiary winding; and
- c. said first portion of said control circuitry further includes a capacitor connected across said full wave center tapped rectifier to smooth the output voltage therefrom.

5. A power control unit for operating a motorized bed as set forth in claim 3 wherein said signal imparted to said sensitive surface of said photo transistor comprises illumination received by said sensitive surface from a light source optically coupled to said photo transistor, said light source being energized in response to actuation of said bed control handset.

6. In a system for operating a motorized bed in response to control signals generated by actuation of a bed control handset, said system including bed height limit positioning means for limiting the travel of said motorized bed and cut-off means for selectively preventing the generation of certain control signals from said bed control handset, the improvement of a power control unit comprising:

- a. control circuitry including at least one portion;
- b. said at least one portion of said control circuitry comprising a photo transistor having a collector and an emitter, a Triac having a gate, a first resistor, a second resistor, and a load connected in circuit with said Triac, said collector of said photo transistor and said gate of said Triac being connected to said first resistor at a junction in said circuit, and said second resistor being connected to the emitter of said photo transistor and
- c. said photo transistor further including a sensitive surface wherein when no signal is imparted to said sensitive surface from said bed control handset said photo transistor conducts very little current and is essentially OFF, and wherein when said sensitive surface of said photo transistor receives a signal from said bed control handset said photo transistor conducts and said junction in said circuit changes electrically from a first voltage to a second voltage causing said Triac to conduct power to said load.

7. In a system for operating a motorized bed as set forth in claim 6 wherein:

- a. said load comprises a first winding of a reversible capacitor split phase motor; and
- b. said signal imparted to said sensitive surface of said photo transistor comprises illumination received by said sensitive surface from a light source optically coupled to said photo transistor, said light source being energized in response to actuation of said bed control handset.

8. In a system for operating a motorized bed in response to control signals generated by actuation of a multi-button bed control handset, said system including bed height limit positioning means for limiting the travel of said motorized bed and cut-off means for selectively preventing the generation of certain control

signals from said bed control handset, the improvement of a power control unit comprising:

- a. control circuitry including a first portion and a plurality of second portions, one of each of said second portions cooperating with one of said buttons of said bed control handset;
- b. said first portion of said control circuitry including a pair of input terminals for connecting said first portion at all times to an AC power source, and a control power transformer;
- c. said control power transformer comprising a primary winding, a secondary winding and a tertiary winding;
- d. said primary winding of said control power transformer being connected to said pair of input terminals and across said AC power source;
- e. said secondary winding of said control power transformer being connected to said buttons of said bed control handset;
- f. said tertiary winding of said control power transformer being connected in circuit with means to form a full wave center tapped rectifier, said means comprising first and second diodes connected to the extremities of said tertiary winding and a tap connected at the center of said tertiary winding, said rectifier being connected to said second portions to connect in circuit said first portion and said second portions;
- g. said second portions each comprising a photo transistor having a collector and an emitter, a Triac having a gate, a first resistor, a second resistor, and a load connected in circuit with said Triac, said collector of said photo transistor and said gate of said Triac being connected to said first resistor at a junction in said circuit, and said second resistor being connected to said emitter of said photo transistor; and
- h. said photo transistor of each of said second portions further including a sensitive surface wherein when no signal is imparted to said sensitive surface from said bed control handset said photo transistor conducts very little current and is essentially OFF, and wherein when said sensitive surface of said photo transistor receives a signal from said bed control handset said photo transistor conducts and said junction in said circuit changes electrically from a first voltage to a second voltage causing said Triac to conduct power to said load.

9. In a system for operating a motorized bed as set forth in claim 8 wherein:

- a. said load of each of said second portions comprises a winding of a reversible capacitor split phase motor; and
- b. said signal imparted to said sensitive surface of said photo transistor of each of said second portions comprises illumination received by said sensitive surface from a light source optically coupled to said photo transistor of each of said second portions, said light source being energized in response to actuation of one of said buttons of said bed control handset.

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