IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF MASSACHUSETTS

L&P PROPERTY MANAGEMENT COMPANY and LEGGETT & PLATT INCORPORATED, Plaintiffs, Vs. JTMD, LLC, dba REVERIE, and ASCION, LLC, Defendants.	Civil Action No. 1:07-CV-10207-RGS

FIRST AMENDED COMPLAINT AND JURY DEMAND

This is an action for patent infringement as a result of defendants' importation, offer for sale and sale of certain adjustable beds, and for false designation of origin and false or misleading description of fact through the defendants' copying of photographs of plaintiffs' beds for use in the marketing and promotion of defendants' beds. The defendants appeared in the present action when it was pending in the United States District Court for the Eastern District of Michigan, but have not filed a responsive pleading.

The Parties

1. Plaintiff L&P Property Management Company ("L&P Property") is a Delaware corporation having its principal place of business at 4095 Firestone Boulevard, South Gate, California 90280.

2. Plaintiff Leggett & Platt Incorporated ("L&P") is a Missouri corporation having its principal place of business at No. 1 Leggett Road, Carthage, Missouri 64836.

3. L&P Property is a wholly-owned subsidiary of L&P and L&P Property holds title to all intellectual property of L&P. L&P Property licenses L&P under all of the intellectual property, including the intellectual property at issue in the present action.

4. On information and belief, defendant JTMD, LLC is a Michigan limited liability company having its principal place of business at 31200 Stafford Street, Beverly Hills, Michigan 48025 and does business under the name Reverie ("Reverie").

5. On information and belief, defendant Ascion, LLC is a Michigan limited liability company having its principal place of business at 31200 Stafford Street, Beverly Hills, Michigan 48025 ("Ascion").

6. On information and belief, Reverie and Ascion do substantial business in the Commonwealth of Massachusetts, including this judicial district, and including placing the product accused to infringe the patents in suit into the stream of commerce for sale, offer for sale and/or importation thereof into this judicial district, and distributing the marketing materials accused to constitute reverse palming off from this judicial district.

Jurisdiction and Venue

7. This is an action for patent infringement arising under the patent laws of the United States, Title 35, United States Code, and false designation of origin arising under 15 U.S.C. § 1125(a). Federal question jurisdiction is conferred pursuant to U.S.C. §§ 1331 and 1338(a). This Court has venue pursuant to 28 U.S.C. § 1391(b)(2).

Count I
Infringement Of United States Patent No. 6,106,576

8. The allegations of paragraphs 1-7 are incorporated by reference as though fully set forth herein.

9. On August 22, 2000, United States Patent No. 6,106,576, entitled "Adjustable Massage Bed Assembly With Handheld Control Unit Having Automatic Stop Safety Feature" was duly and legally issued (hereinafter "the '576 patent"). In 1999, L&P Property became the owner by assignment of the application that issued as the '576 patent and, since that time, L&P Property has been the owner of the '576 patent. L&P is licensed under the '576 patent by L&P Property. A copy of the '576 patent is attached hereto as Exhibit 1.

10. On information and belief, Reverie and Ascion have infringed and are currently infringing under 35 U.S.C. § 271 one or more claims of the '576 patent through the offer for sale, sale and importation into the United States of certain adjustable beds, including an adjustable bed sold by Reverie and Ascion to Lady Americana for resale by Lady Americana under the name "Twin XL Wallsaver with Massage."

11. On information and belief, the adjustable beds being offered for sale, sold and imported into the United States, including the adjustable bed sold by Reverie and Ascion to Lady Americana for resale by Lady Americana under the name "Twin XL Wallsaver with Massage," are manufactured in the Peoples Republic of China.

12. On information and belief, the acts of infringement complained of herein are being carried out willfully and with full knowledge by Reverie and Ascion of the '576 patent.

13. As a result of the actions of Reverie and Ascion, L&P Property and L&P have suffered, and continue to suffer, substantial injury, including irreparable injury, and will result in damages to L&P Property and L&P, including loss of sales and profits, which L&P Property and L&P would have made but for the infringement by Reverie and Ascion, unless Reverie and Ascion are enjoined by this Court.

Count II
Infringement Of United States Patent No. 6,684,423

14. The allegations of paragraphs 1-12 are incorporated by reference as though fully set forth herein.

15. On February 3, 2004, United States Patent No. 6,684,423, entitled "Massage Motor Mounting for Bed/Chair" was duly and legally issued to L&P Property (hereinafter "the '423 patent"), and since that date, L&P Property has been the owner of the '423 patent. L&P is licensed under the '423 patent by L&P Property. A copy of the '423 patent is attached hereto as Exhibit 2.

16. On information and belief, Reverie and Ascion have infringed and are currently infringing under 35 U.S.C. § 271 one or more claims of the '423 patent through the offer for sale, sale and importation into the United States of certain adjustable beds, including an adjustable bed sold by Reverie and Ascion to Lady Americana for resale by Lady Americana under the name "Twin XL Wallsaver with Massage."

17. On information and belief, the adjustable beds being offered for sale, sold and imported into the United States, including the adjustable bed sold by Reverie and Ascion to Lady Americana for resale by Lady Americana under the name "Twin XL Wallsaver with Massage," are manufactured in the Peoples Republic of China.

18. On information and belief, the acts of infringement complained of herein are being carried out willfully and with full knowledge by Reverie and Ascion of the '423 patent.

19. As a result of the actions of Reverie and Ascion, L&P Property and L&P have suffered, and continue to suffer, substantial injury, including irreparable injury, and will result in damages to L&P Property and L&P, including loss of sales and profits, which L&P

Property and L&P would have made but for the infringement by Reverie and Ascion, unless Reverie and Ascion are enjoined by this Court.

Count III
Infringement Of United States Patent No. 5,235,258

20. The allegations of paragraphs 1-17 are incorporated by reference as though fully set forth herein.

21. On August 10, 1993, United States Patent No. 5,235,258, entitled "Remotely Controlled Articulated Bed" was duly and legally issued (hereinafter "the '258 patent"). In 2003, L&P Property became the owner by assignment of the '258 patent and, since that time, L&P Property has been the owner of the '258 patent. L&P is licensed under the '258 patent by L&P Property. A copy of the '258 patent is attached hereto as Exhibit 3.

22. On information and belief, Reverie and Ascion have infringed and are currently infringing under 35 U.S.C. § 271 one or more claims of the '258 patent through the offer for sale, sale and importation into the United States of certain remotely controlled adjustable beds, including a remotely controlled adjustable bed sold by Reverie and Ascion to Lady Americana for resale by Lady Americana under the name "Twin XL Wallsaver with Massage."

23. On information and belief, the adjustable beds being offered for sale, sold and imported into the United States, including the adjustable bed sold by Reverie and Ascion to Lady Americana for resale by Lady Americana under the name "Twin XL Wallsaver with Massage," are manufactured in the Peoples Republic of China.

24. On information and belief, the acts of infringement complained of herein are being carried out willfully and with full knowledge by Reverie and Ascion of the '258 patent.

25. As a result of the actions of Reverie and Ascion, L&P Property and L&P have suffered, and continue to suffer, substantial injury, including irreparable injury, and will result in damages to L&P Property and L&P, including loss of sales and profits, which L&P Property and L&P would have made but for the infringement by Reverie and Ascion, unless Reverie and Ascion are enjoined by this Court.

Count IV
Violation of 15 U.S.C. § 1125(a) – False Designation of Origin and False or Misleading Description of Fact

26. The allegations of paragraphs 1-22 are incorporated by reference as though fully set forth herein.

27. L&P is a leader in the marketing and sale of high quality adjustable beds. As part of its marketing of its adjustable beds, L&P provides marketing materials to retailers for their use in advertising those beds to end consumers. Included in these marketing materials are a variety of photographs of L&P adjustable beds.

28. On information and belief, Reverie and Ascion have knowingly, intentionally and willfully copied a number of photographs of L&P adjustable beds from the L&P marketing materials and have used those photographs in brochures distributed by Reverie and Ascion to manufacturers, retailers and other potential customers, and in a PowerPoint presentation used by Reverie and Ascion in presentations to manufacturers, retailers and other potential customers as allegedly showing Reverie/Ascion adjustable beds.

29. The use by Reverie and Ascion of photographs of L&P adjustable beds in marketing materials as allegedly showing Reverie/Ascion adjustable beds constitutes a false

designation of origin and false or misleading description of fact in commercial advertising or promotion that misrepresents the nature, characteristics and qualities of the Reverie/Ascion beds.

30. The above actions of Reverie and Ascion constitute a false designation of origin and false or misleading description of fact in violation of 15 U.S.C. § 1125(a), which is likely to damage L&P Property and L&P, and for which L&P Property and L&P are without an adequate remedy at law, and have caused L&P Property and L&P to suffer monetary damage in an amount thus far not determined.

WHEREFORE, L&P Property and L&P pray:

A. That this Court enter a decree holding that Reverie and Ascion have infringed United States Patent No. 6,106,576, United States Patent No. 6,684,423 and United States Patent No. 5,235,258; and that Reverie and Ascion have falsely designated the source of their adjustable beds and made false or misleading descriptions of fact regarding their adjustable beds through the use of photographs of L&P adjustable beds in their marketing materials.

B. That Reverie and Ascion, and their agents, employees, successors and assigns, and any and all persons or entities acting at, through, under or in active concert or participation with or under authority of or from them, be preliminarily and permanently enjoined and restrained from:

1) infringing United States Patent No. 6,106,576, United States Patent No. 6,684,423 and/or United States Patent No. 5,235,258; and

2) from using photographs of L&P adjustable beds in any marketing, promotion and/or advertisement of Reverie and/or Ascion adjustable beds.

C. That Reverie and Ascion deliver up for destruction all advertising, promotional and marketing materials that include any photographs of L&P adjustable beds, and discontinue use of such on any signs, newspaper or other advertisements, Internet websites, and/or any other printed or otherwise published materials.

D. That a judgment be entered that Reverie and Ascion be required to pay over to L&P Property and L&P all damages sustained by L&P Property and/or L&P due to Reverie's and Ascion's patent infringement, and that such damages be trebled pursuant to 35 U.S.C. § 284 for the willful acts of infringement complained of herein.

E. That a judgment be entered that Reverie and Ascion be required to pay over to L&P Property and L&P all profits realized by Reverie and/or Ascion, and all damages sustained by L&P Property and/or L&P by reason of Reverie's and Ascion's acts of false designation of origin and false or misleading descriptions of fact, and that and that any such award be trebled in view of Reverie's and Ascion's willful conduct.

F. That this is an exceptional, willful, and flagrant case and that L&P Property and L&P be awarded the cost of this action and reasonable attorneys' fees pursuant to 35 U.S.C. § 285 and 15 U.S.C § 1117(a).

G. That Reverie and Ascion be ordered to file with this court and serve on L&P Property and L&P within thirty (30) days after entry of final judgment of this cause a report in writing under oath setting forth in detail the manner and form in which Reverie and Ascion have complied with the final judgment.

H. For such other and further relief as the nature of the case may require and as may be deemed just and equitable.

Jury Demand

Plaintiffs L&P Property Management Company and Leggett & Platt Incorporated hereby demand and request trial by jury of all issues that are triable by jury.

Respectfully submitted,

Dated: February 16, 2007

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CERTIFICATE OF SERVICE

I hereby certify that on February 16, 2007, I served the foregoing **First Amended Complaint And Jury Demand** on the following counsel of record by first class mail, postage prepaid:

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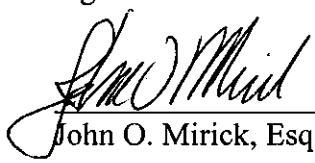

John O. Mirick, Esq

Exhibit 1

US006106576A

United States Patent [19]

Fromson

[11] Patent Number: 6,106,576

[45] Date of Patent: *Aug. 22, 2000

[54] **ADJUSTABLE MASSAGE BED ASSEMBLY WITH HANDHELD CONTROL UNIT HAVING AUTOMATIC STOP SAFETY FEATURE**

[75] Inventor: **Leonard E. Fromson**, La Mirada, Calif.

[73] Assignee: **Maxwell Products, Inc.**, Cerritos, Calif.

[*] Notice: This patent is subject to a terminal disclaimer.

[21] Appl. No.: **08/649,261**

[22] Filed: **May 17, 1996**

Related U.S. Application Data

[62] Division of application No. 08/277,511, Jul. 19, 1994.

[51] **Int. Cl.**[7] **C12N 5/00**

[52] **U.S. Cl.** **818/16**

[58] **Field of Search** 318/16, 563, 560; 5/915, 616, 618

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Primary Examiner—Karen Masih

Attorney, Agent, or Firm—Blakely, Sokoloff Taylor & Zafman LLP

[57] **ABSTRACT**

An adjustable massage bed assembly including a head motor for controllably raising and lowering a head section of a mattress, a foot motor for controllably raising and lowering a foot section of the mattress, and a vibratory motor for imparting a massaging action to the mattress. A handheld control unit has first and second mechanisms for controlling operations of the head and foot motors, and a third mechanism for controlling an operation of the vibratory motor. The third mechanism when actuated also automatically stops any ongoing operation of the head and foot motors as a safety feature.

14 Claims, 5 Drawing Sheets

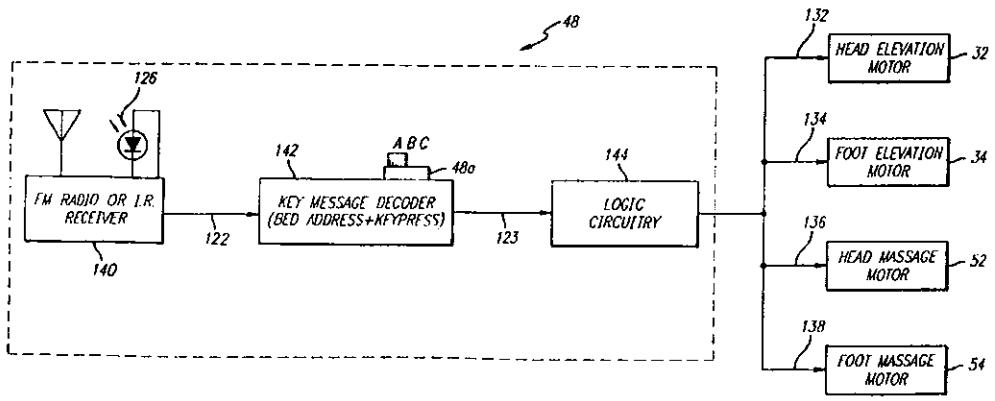

EXHIBIT 1

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FIG. 1

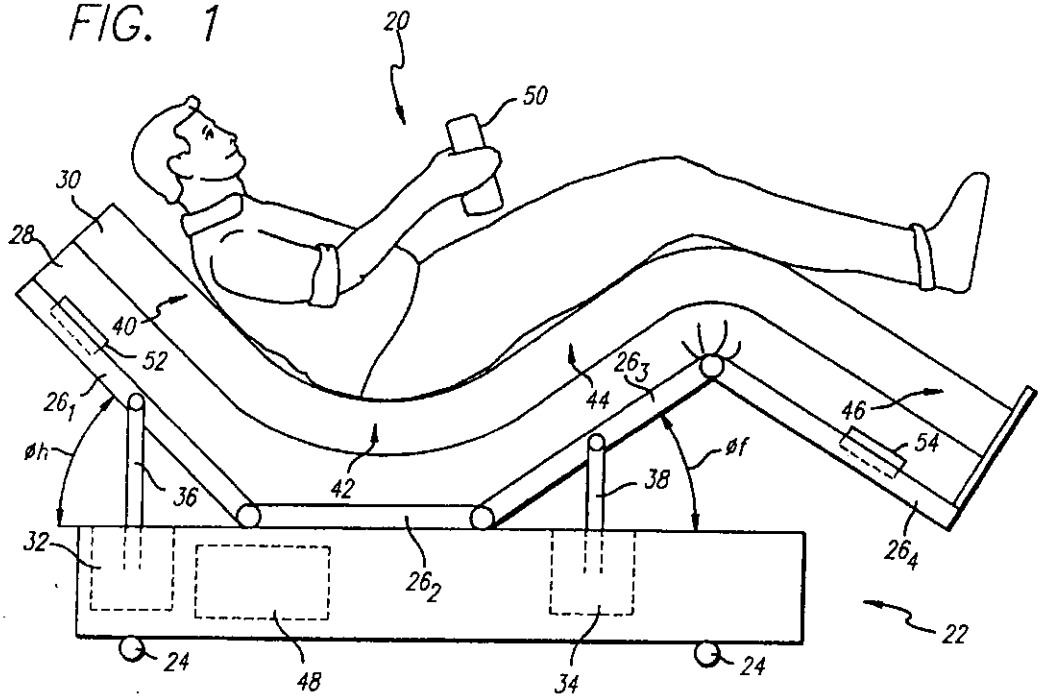
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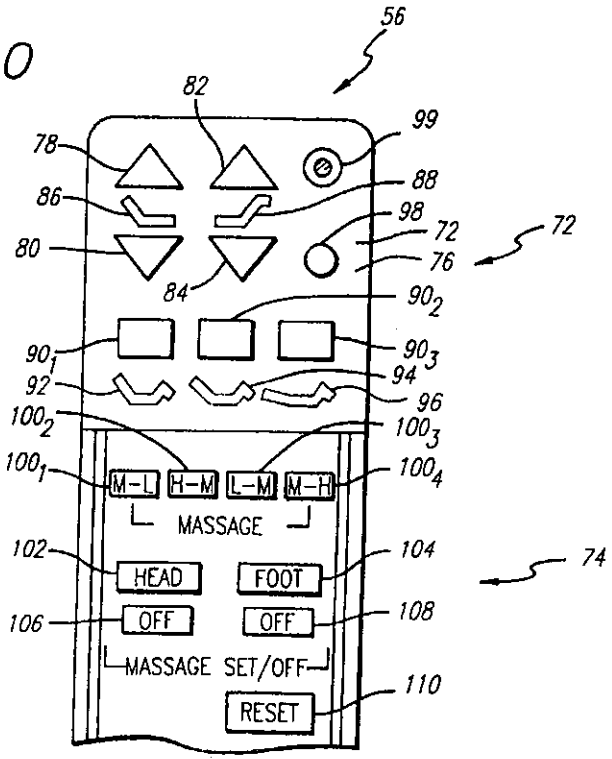
FIG. 10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100_2
100_3
100_1
100_4
M-L
H-M
L-M
M-H
MASSAGE
102
104
74
HEAD
FOOT
106
OFF
OFF
108
MASSAGE SET/OFF
110
RESET

FIG. 2

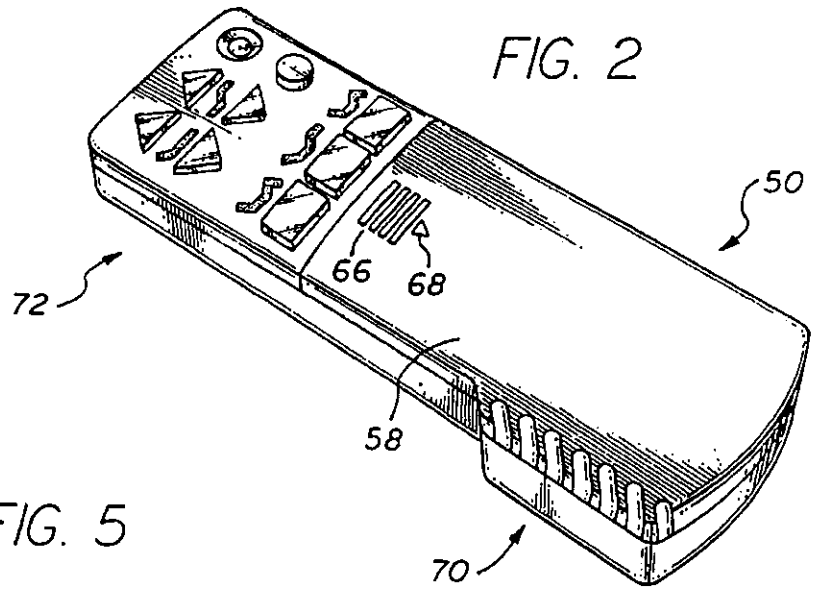


FIG. 5

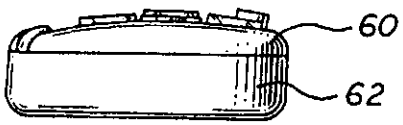


FIG. 3

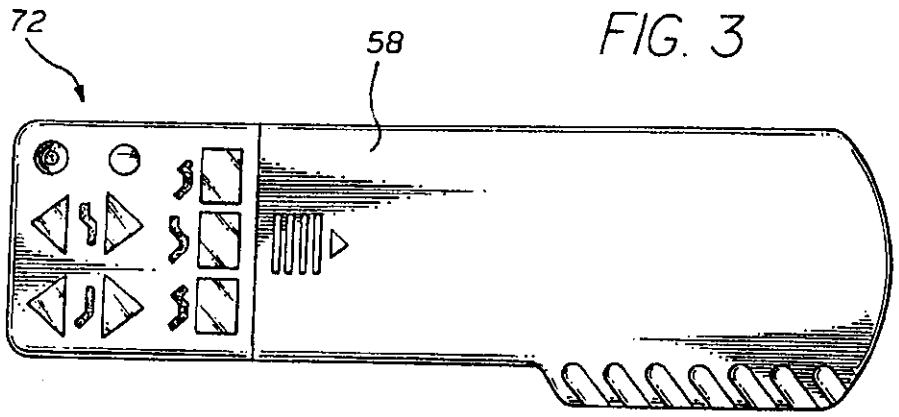


FIG. 4

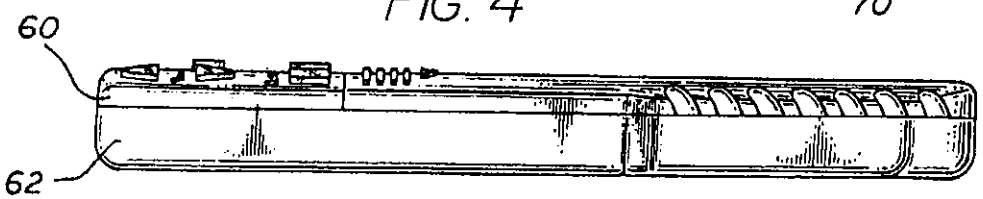
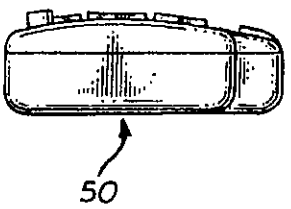


FIG. 6



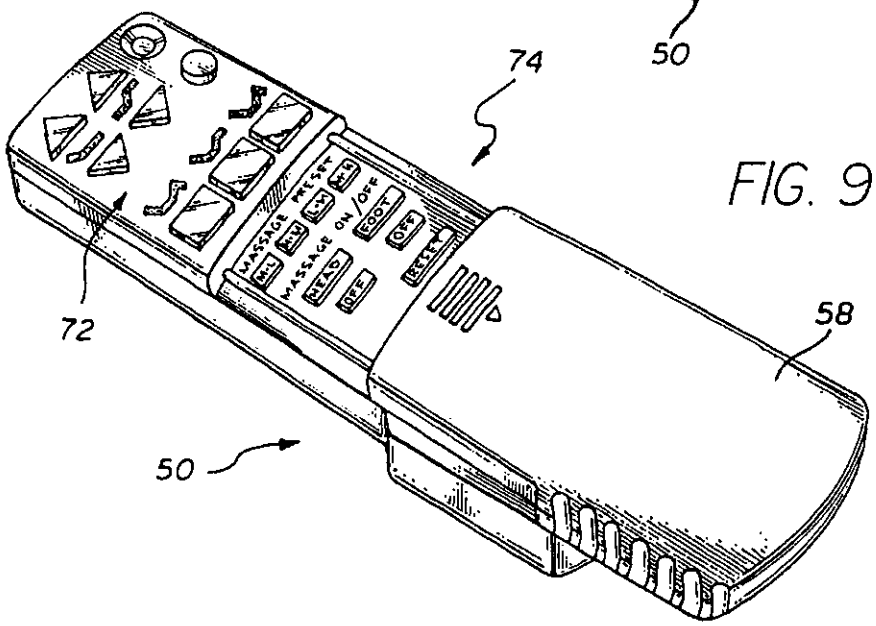


FIG. 9

FIG. 7

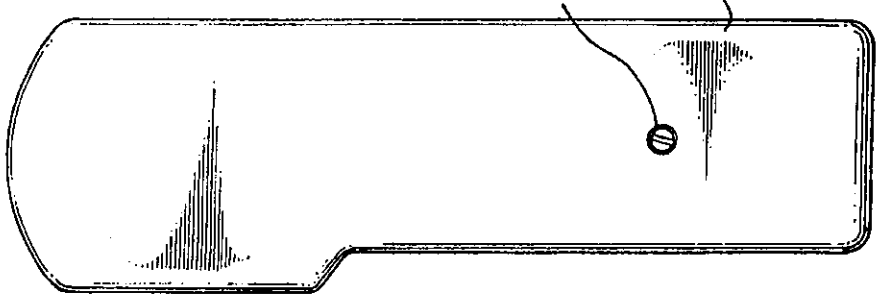
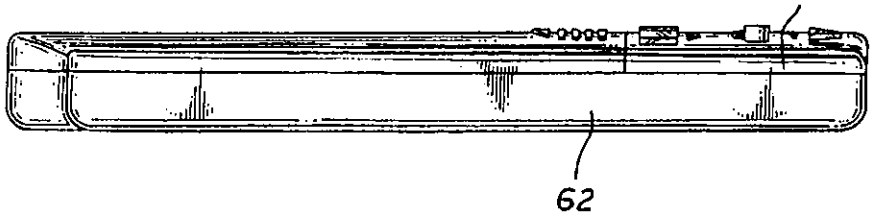
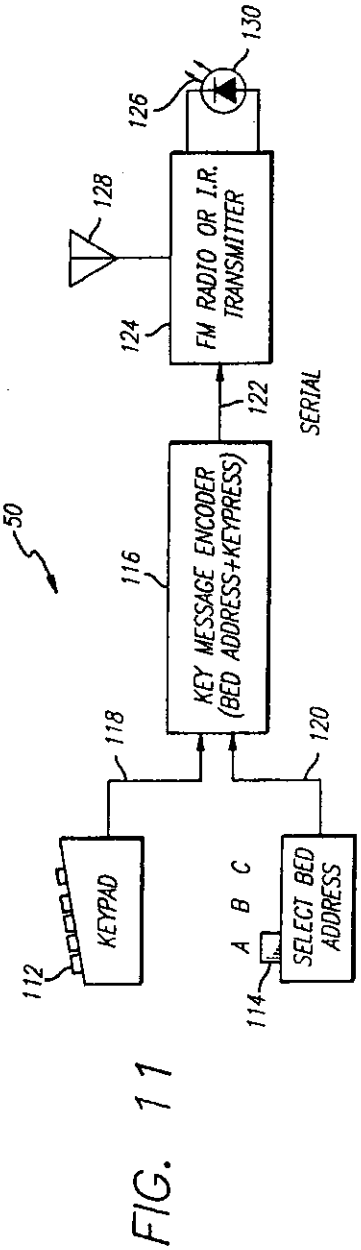


FIG. 8

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116
KEY MESSAGE ENCODER (BED ADDRESS+KEYPRESS)
118
120
KEYPAD
112
A B C
SELECT BED ADDRESS
114
122
SERIAL
124
FM RADIO OR I.R. TRANSMITTER
128
126
130

FIG. 11

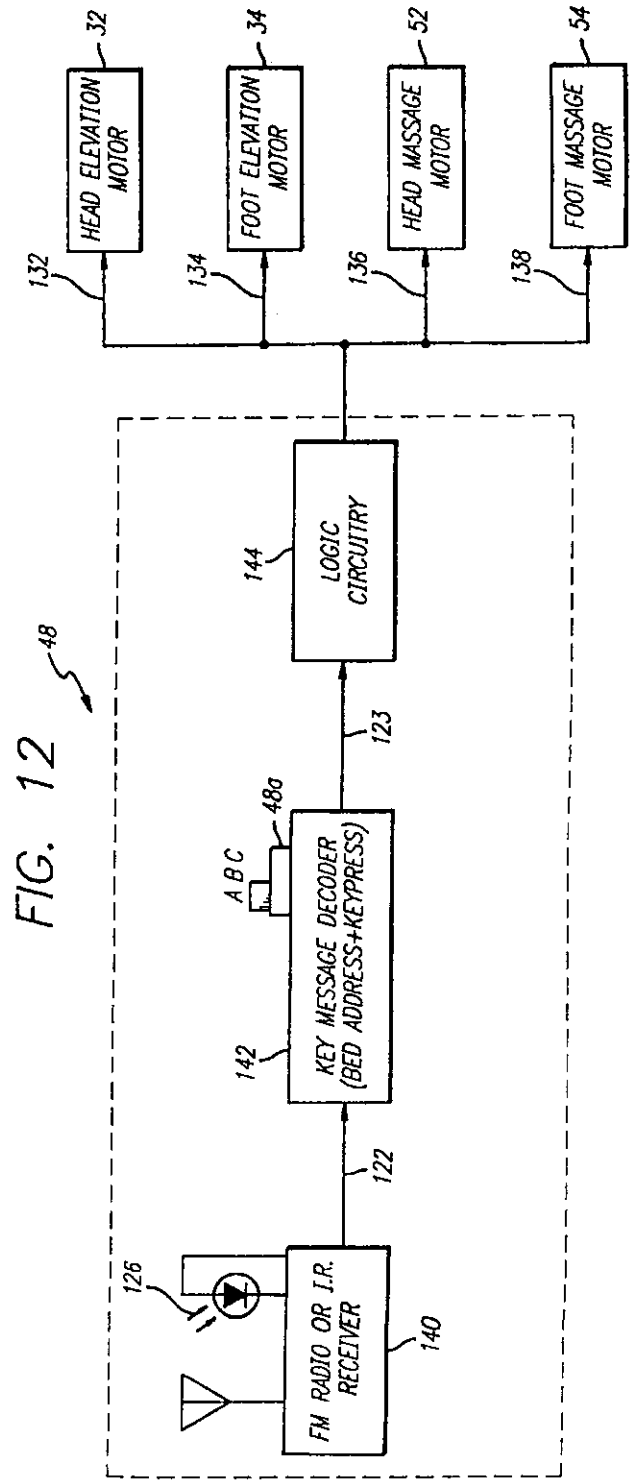
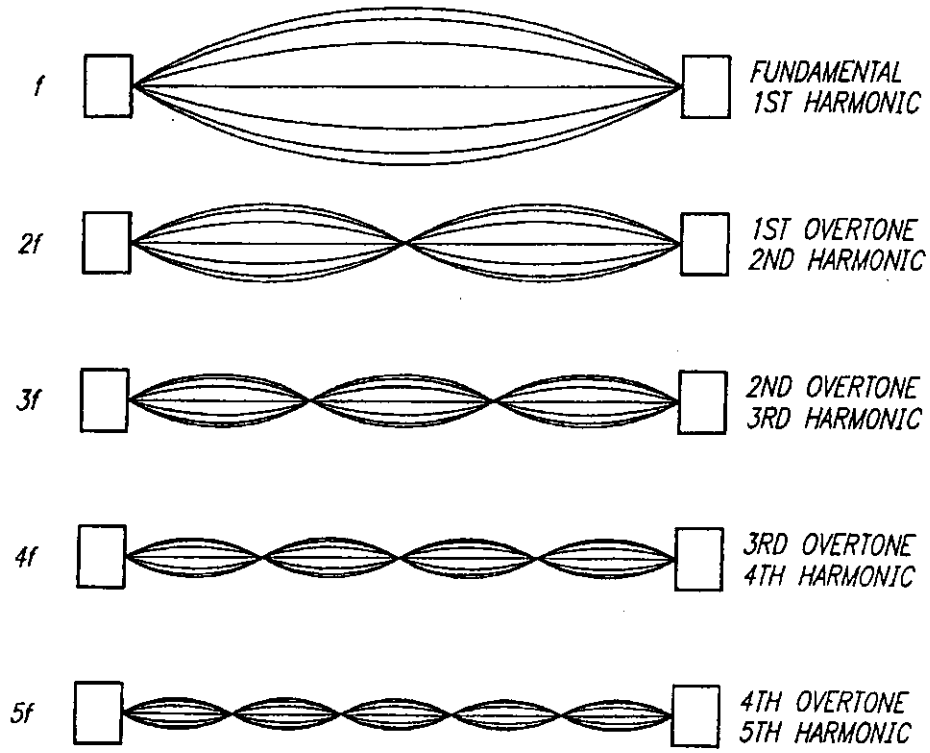

48
HEAD ELEVATION MOTOR
32
FOOT ELEVATION MOTOR
34
HEAD MASSAGE MOTOR
52
FOOT MASSAGE MOTOR
54
132
134
136
138
LOGIC CIRCUITRY
144
123
48a
A B C
KEY MESSAGE DECODER (BED ADDRESS+KEYPRESS)
142
122
126
FM RADIO OR I.R. RECEIVER
140

FIG. 12

FIG. 13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FUNDAMENTAL
1ST HARMONIC
2f
1ST OVERTONE
2ND HARMONIC
3f
2ND OVERTONE
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4TH HARMONIC
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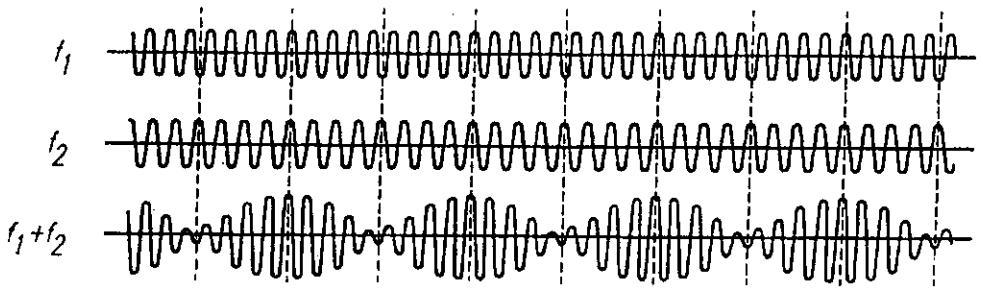
FIG. 14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f_1+f_2

ADJUSTABLE MASSAGE BED ASSEMBLY WITH HANDHELD CONTROL UNIT HAVING AUTOMATIC STOP SAFETY FEATURE

CROSS-REFERENCE TO RELATED APPLICATION

This is a divisional of copending application Ser. No. 08/277,511 filed on Jul. 19, 1994 pending.

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to an articulated bed assembly with a simplified remote control and, more particularly, pertains to an articulated bed assembly with a simplified remote control unit including several groups of buttons only one of which is accessible to the user when a face cover of the remote control unit is slid into a closed position.

2. Description of the Related Art

An articulated bed includes one or several mechanisms which allow different portions of the bed to be tilted or otherwise positionally adjusted. The comfort of individuals who are "bedridden" may be enhanced by providing an articulated bed that is easily adjusted. Although various mechanisms for adjusting the configuration of a bed are known, the art is still without an articulated bed assembly which includes, and is remotely controlled by, a simplified remote control unit.

Accordingly, an object of the present invention is to provide an articulated bed assembly with a simplified remote control unit.

Another object is to provide an articulated bed assembly with a simplified remote control unit that includes several groups of buttons some of which may be concealed from the user's view by a slidable face cover.

Still another object of the present invention is to provide an articulated bed assembly with a simplified remote control unit which additionally allows the user to select from a number of preset bed positions by pressing a single button which is designated by an icon identifying the desired preset bed position.

Yet another object of the present invention is to provide an articulated bed assembly with a simplified remote control unit which allows a stored massage mode to be recalled with a single button.

Another object of the present invention is to provide an articulated bed assembly with a simplified remote control unit that further includes head and foot massage motors which operate at preset massage modes and which may be manually adjusted to operate at low, medium and high frequencies via the remote control unit.

An additional object of the present invention is to provide an articulated bed assembly with a simplified remote control unit wherein the operating frequencies of the head and foot massage motors are selected to provide a beat frequency vibration effect between head and foot portions of the bed.

SUMMARY OF THE INVENTION

In accordance with a specific illustrative embodiment of the present invention, an articulated bed assembly with a simplified remote control unit includes a head elevation motor for raising or lowering a head position of the bed in response to a head elevation signal, and a foot elevation motor for raising or lowering a foot portion of the bed in response to a foot elevation signal. The bed assembly further includes a head massage motor for vibrating the head portion of the bed in response to a head massage signal, and a foot massage motor for vibrating the foot portion of the bed in response to a foot massage signal. The bed assembly also includes a simplified remote control unit with a plurality of user activated mechanisms (such as buttons), an encoder and a transmitter. The user activated mechanisms provide user input signals to the encoder when a user activates the mechanisms. The various user activated mechanisms provide a raised head portion signal, a lower head portion signal, a raised foot portion signal, a lower foot portion signal, a bed position preset signal, a stored massage signal, a head massage motor speed signal, a foot massage motor speed signal, and a massage motors preset signal as the user input signals. The encoder encodes the user input signals to provide an encoded signal which is transmitted as a modulated encoded signal by the transmitter. The bed assembly additionally includes a bed controller unit with a receiver, a decoder, and logic circuitry. The modulated encoded signal is received and demodulated by the receiver to provide the encoded signal to the decoder which decodes the encoded signal to provide the user input signals. The logic circuitry generates the head elevation signal, the foot elevation signal, the head massage signal, and the foot massage signal from the user input signals.

In a further aspect of the present invention, the simplified remote control unit serves as an improvement to an articulated bed assembly and includes a plurality of buttons as the user activated mechanisms. The plurality of buttons includes a first and second group of buttons. Such a simplified remote control unit additionally includes a slidable face cover which conceals the second group of buttons when the face cover is slid into a closed position.

In other words, disclosed herein is an articulated bed assembly with a simplified remote control unit, head and foot elevation motors, head and foot massage motors and a bed controller unit. The simplified remote control unit includes an encoder and a transmitter for providing user input signals to the bed controller unit. The simplified remote control unit also includes groups with some of the buttons which are proximately arranged and geometrically shaped according to function with some of the buttons being concealable behind a face cover of the remote control unit. The bed controller unit includes a receiver, a decoder and logic circuitry for retrieving the user input signals and generating command signals to the head and foot elevation motors and the head and foot massage motors.

DESCRIPTION OF THE DRAWINGS

Other objects, features and advantages of the invention will become readily apparent upon reference to the following detailed description when considered in conjunction with the accompanying drawings, in which like reference numerals designate like parts throughout the figures thereof, and wherein

FIG. **1** is side view of the articulated bed assembly of the present invention;

FIG. **2** is a perspective view of the simplified remote control unit of the articulated bed assembly;

FIG. **3** is a front view of the simplified remote control unit;

FIG. **4** is a left side view of the simplified remote control unit;

FIG. **5** is a bottom view of the simplified remote control unit;

FIG. 6 is a top view of the simplified remote control unit;

FIG. 7 is a rear view of the simplified remote control unit;

FIG. 8 is a right side view of the simplified remote control unit;

FIG. 9 is a perspective view of the simplified remote control unit showing a slidable face cover of the unit in an opened position;

FIG. 10 is an enlarged front view of the simplified remote control unit with its slidable face cover in the open position;

FIG. 11 is a functional block diagram of the simplified remote control unit;

FIG. 12 is a functional block diagram of the bed controller unit;

FIG. 13 shows a fundamental frequency of the head or foot massage motor and harmonics thereof; and

FIG. 14 shows how a fundamental frequency of either the head or foot massage motor may combine with harmonics of the other massage motor to generate a beat frequency vibration effect between the head and foot portions of the bed.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

FIG. 1 shows an articulated bed assembly **20** of the present invention which includes a base **22** which may be, but is not necessarily, supported by wheels or casters **24**. The bed assembly **20** includes articulated support plates 26_1, 26_2, 26_3, 26_4 which supports a cloth covered foam layer **28** and a mattress **30**.

A head elevation motor **32** and a foot elevation motor **34** are assembled within and/or attached to the base **22**. The elevation motors **32, 34** are conventional and respectively drive linear actuators **36, 38**.

As is shown in FIG. **1**, the bed assembly **20** may be approximately partitioned into a head portion **40**, a midriff portion **42**, a thigh portion **44** and a foot portion **46** along a length of the mattress **30**. Below the head portion **40**, the support plate 26_1 is mechanically connected to the linear actuator **36** and is raised or lowered in elevation by the head elevation motor **32**. Similarly, the support plate 26_3 which is positioned beneath the thigh portion **44** is mechanically connected to the linear actuator **38** and is raised or lowered in elevation by the foot elevation motor **34**. The elevation motors **32, 34** are both electrically connected to and driven by a bed controller unit **48** which is preferably assembled within the base **22**. The bed assembly **20** also includes a simplified remote control unit **50** for transmitting a modulated encoded signal to the bed controller unit **48**. Generally, a user is able to manipulate the bed assembly **20** into one of several predetermined bed positions, via the bed controller unit **48**, by pressing an appropriate button on the remote control unit **50**. The bed assembly **20** additionally includes a head massage motor **52** and a foot massage motor **54** which are respectively attached to the support plates 26_1, 26_4. The massage motors **52, 54** are controlled by and electrically connected to the bed controller unit **48** and vibrate the foam layer **28** and the mattress **30** when appropriately driven. As with the elevation motors **32, 34**, the massage motors **52, 54** are controlled, via the bed controller unit **48**, by a user who presses buttons on the remote control unit **50** which are dedicated to controlling the massage motors.

FIGS. **2** and **3** show a preferred embodiment of the remote control unit **50** which includes a housing **56** with a slidable face cover **58**. The housing **56**, which is preferably sized to be conveniently held in an adult's hand, and the face cover **58** may be formed from an inexpensive plastic such as polystyrene. As shown in FIGS. **4, 5, 6** and **8**, the housing **56** is preferably separated into a top shell **60** and a matching bottom shell **62** which are fitted together defining an inner chamber. FIG. **7** shows that a screw **64** may be fitted through the bottom shell **62** and into the top shell **60** securing shells **60, 62** together. As may be readily appreciated, any of a number of conventional fastening means may be utilized to secure the top shell **60** to the bottom shell **62**, for example, latches, screws, force fitting members, etc.

As is best illustrated in FIGS. **2** and **3**, the face cover **58** advantageously includes a plurality of parallel ridges **66** which may be gripped by the user's thumb to slide the face cover **58** in the direction of an arrow **68** which appears on the face cover. Preferably, the shells **60, 62** and the face cover **58** are asymmetrically shaped along a length of the remote control unit **50** so that a user will become more familiar with the shape of the unit **50** and thus be able to more quickly orient the unit within his or her hand. For example, the remote control unit **50** may be formed with an extended portion **70** which quickly identifies which portion of the unit **50** is to be held in the user's hand, even when little or no light is available in the room.

An important feature of the present invention is the face cover **58** which conceals some of the user mechanisms to simplify operation of the remote control unit **50**. The subject matter of the present invention additionally contemplates a face cover **58** which is secured to the housing **56** by a hinge or other mechanism. Generally the cover **58** provides a simple way of alternatively concealing and accessing some of the user mechanisms as desired.

To this end, the remote control unit **50** provides a limited selection of buttons when the face cover **58** is slid into its closed position. More specifically, and as is shown in FIGS. **2** and **3**, only a first group of buttons **72** is accessible to the user when the face cover **58** is slid into its closed position. FIG. **9** shows the remote control unit **50** with the face cover **58** slid into its opened position. A second group of buttons **74** becomes accessible to the user when the face cover **58** is slid into the opened position.

FIG. **10** is an enlarged front view of the remote control unit **50** with the face cover **58** slid into its opened position. The first group of buttons **72** are fitted within the housing **56** and extend therefrom at a front portion **76** of the housing **56**. An additional feature of the present invention is that the first group of buttons **72** is positioned within the front portion **76**, shaped, and labeled with distinguishing icons depending upon the functions of the respective buttons within the first group **72**. Accordingly, and as illustrated in FIG. **10**, the front portion **76** also includes a plurality of icons adjacent to the first group of buttons **72**. More specifically, the first group of buttons **72** includes a pair of head portion elevation buttons **78, 80** which respectively generate a raise head portion signal and a lower head portion signal when pressed by the user. The first group of buttons **72** also include a pair of foot portion elevation buttons **82, 84** which respectively provide a raise foot portion signal and a lower foot portion signal when pressed by user. A head portion elevation icon **86** may be positioned on the front portion **76** between the elevation buttons **78, 80**. Similarly, a foot portion elevation icon **88** may be positioned on the front portion **76** between the elevation buttons **82, 84**. Icons **86, 88** and all hereinafter described icons are preferably applied to the front portion **76** in the form of a visible (or even fluorescent) ink, dye, decal, paint, label, etc. The head portion elevation icon **86** is preferably a simplified profile of the bed assembly **20** shown

with the head portion **40** in a raised position. The foot portion elevation icon **88** is preferably a simplified profile of the bed assembly **20** shown with the thigh portion **44** and the foot portion **46** in a raised position.

Elevation buttons **78, 80, 82, 84** are preferably shaped as equilateral triangles and the buttons are preferably oriented such that the base side of the buttons triangular shape faces its corresponding icon. The elevation buttons **78, 80, 82, 84** are all triangularly shaped and oriented to either point in an upward or downward direction along the length of the remote control unit **50**. Since each pair of elevation buttons is clearly and visibly associated with an icon, the function of each of the buttons is abundantly clear even to a user who is inexperienced with or intimidated by remote control devices. Thus, the elevation buttons **78, 80, 82, 84** are preferably of a first shape such as the above-described equilateral triangle. Furthermore, the buttons included within the first group **72** may be formed in distinctly different geometric shapes depending upon their function.

The first group of buttons **72** also includes a plurality of preset bed position buttons 90_1, 90_2, 90_3 which are preferably arranged in a horizontal row perpendicular to the length of the remote control unit **50**. The preset bed position buttons 90_1, 90_2, 90_3 are formed in a second shape which is preferably, but not necessarily, that of a rectangle. Corresponding preset bed position icons **92, 94, 96** are respectively positioned on the front portion **76** adjacent to the present bed position buttons 90_1, 90_2, 90_3.

When any of the preset bed position buttons 90_1, 90_2, 90_3 are pressed by the user a bed position preset signal is generated and the bed controller unit **48** responds by appropriately driving the elevation motors **32, 34** to positions which respectively correspond to "chair", "lounge" and "back relief". For example, the foregoing preset bed positions may be defined in terms of the angle ϕ_h measured between the base **22** and the support plate 26_1 and the angle ϕ_f measured between the base **22** and the support plate 26_3 (FIG. **1**). When button 90_1 is pressed, the controller unit **48** drives the bed assembly **20** into the preset "chair" position wherein ϕ_h=54° and ϕ_f=13°. When button 90_2 is pressed, the bed assembly **20** is similarly manipulated into the "lounge" position such that $\phi 1_h$=37° and ϕ_f=19°. When button 90_3 is pressed, the bed assembly **20** is driven by the motors **32, 34** into the "back relief" position wherein ϕ_h=5° and ϕ_f=40°. As may be readily appreciated, the aforedescribed preset positions are merely exemplary and are not intended to serve a limiting purpose insofar as how the bed control unit **48** may be programmed to drive the elevation motors **32, 34** to position the mattress **30** in various preset bed positions.

In operation, a user presses one of the preset bed position buttons 90_1, 90_2, 90_3 to manipulate the bed assembly **20** as desired. The preset bed position icons **92, 94, 96** are preferably simplified profiles of the bed assembly **20** shaped as the desired preset position. Accordingly, the icon **92** should closely resemble the "chair" preset position described above. The preset bed position icons **92, 94** should likewise resemble the bed assembly **20** after it has been manipulated into the above-described "lounge" and "back relief" preset positions respectively.

Although the above-described preset bed positions have been ergonomically selected to accommodate the needs of a great many users, the bed controller unit **48** is preferably designed to permit a-finer adjustment of the positions of the head portion **40** or the thigh portion **44** and foot portion **46** after the preset bed position has been reached by pressing the elevation buttons **78, 80, 82, 84**. Additionally, the bed controller unit **48** may be programmed (or include logic circuitry) to stop all movements of the head portion **40**, the thigh portion **44**, and the foot portion **46** when any of the buttons on the remote control unit **50** is pressed while the bed controller unit **48** is controlling the movement of bed assembly **20** to any of the preset bed positions. Such a safety feature is clearly desirable in that a user of the remote control unit **50** need not frantically search for a particular button which alone is capable of stopping the bed's movement should, for example, a limb, small child, or pet inadvertently position itself between the base and the articulated support plate 26_1, 26_3, 26_4.

The first group of buttons **72** also includes a stored massage button **98** which provides a stored massage signal. The stored massage button **98** is of a third shape which is preferably, but not necessarily, circular. In keeping with the spirit of simplification, the bed controller unit **48** controls the massage motors **52, 54** according to a stored massage mode which may, for example, be the last massage selected. Lastly, the first group of buttons **72** may also include a light emitting device **99** such as a light emitting diode (LED) for indicating when the remote control unit **50** is operating, when a battery therein is generating insufficient current, etc.

At this point, it is worthwhile to note that all of the buttons may be more broadly described as user activated mechanisms. As such, the contemplated subject matter of the present invention additionally includes user activated mechanisms such as switches, levers, heat and Light sensing elements, etc. Although the preferred buttons are raised relative to the housing **56**, such a tactile construction is not an indispensable element of the simplified remote control unit **50**.

The second group of buttons **74** is positioned on the housing **56** and concealable by the face cover **58**. Accordingly, a nurse or other more capable user of the remote control unit **50** may access and thereby utilize additional capabilities of the bed controller unit **48** via the remote control unit **50**. The second group of buttons **74** includes a plurality of preset massage buttons 100_1, 100_2, 100_3, 100_4. The preferred bed controller unit **48** is designed to drive the head massage motor **52** at predetermined low, medium and high head massage motor frequencies. Similarly, the controller unit **48** drives the foot massage motor **54** at predetermined low, medium and high foot massage motor frequencies. It has been observed that the articulated bed assembly **20** provides a different quality massage depending upon how much the bed assembly **20** is loaded (i.e., the user's weight). For example, a person who weighs one hundred and ten pounds may prefer a massage wherein the head massage motor **52** operates at its predetermined medium head massage motor frequency and wherein the foot massage motor **54** operates at its predetermined low foot massage motor frequency. Such a massage is commanded by the bed controller unit **48** when the button 100_1 is pressed by the user.

As shown in FIG. **10**, the legend "M-L" is inscribed upon, marked on, or otherwise applied to the preset massage button 100_1. By way of further example, a person who weighs over 200 lbs. may prefer the massage which results from pressing the button 100_2 wherein the head massage motor **52** operates at its predetermined high frequency and wherein the foot massage motor **54** operates at its predetermined medium frequency. The massage modes corresponding to buttons 100_3, 100_4 respectively correspond to "L-M" and "M-H" massage modes and are not further described.

The bed controller unit **48** is designed to begin a user selected massage mode upon the user's activation of any of

the preset massage buttons 100_1, 100_2, 100_3, 100_4. Such a massage will continue for a predetermined period of time, such as five minutes, and then automatically terminate. Selection of any of the preset massage buttons 100_1, 100_2, 100_3, 100_4 generates a massage motors preset signal which is provided to the controller unit **48**. In response, the controller unit **48** generates the head and foot massage signals which respectively drive the massage motors **52**, **54**.

When any of the preset massage buttons 100_1, 100_2, 100_3, 100_4 are pressed, the head massage signal is provided to the head massage motor **52** as a head massage motor "on" signal at either the predetermined low, medium or high head massage motor frequency during the duration of the selected massage. Similarly, the foot massage signal is provided to the foot massage motor **54** as a foot massage motor "on" signal at the predetermined low, medium or high foot massage motor frequency depending upon which massage mode was selected. After the preselected massage terminates, the bed controller unit **48** provides the head massage signal as a head massage motor "off" signal and the foot massage signal as a foot massage motor "off" signal thus stopping all vibrations of the bed assembly **20**.

The second group of buttons **74** additionally includes a head massage motor speed adjustment button **102** and a foot massage motor speed adjustment button **104**. Both buttons **102**, **104** override a preset massage. More specifically, the head massage motor speed adjustment button **102** sequentially cycles the head massage motor "on" signal through the predetermined low, medium and high head massage motor frequencies. Similarly, the foot massage motor speed adjustment button **104** sequentially cycles the foot massage motor "on" signal through the predetermined low, medium and high foot massage motor frequencies. Thus, and by way of example, a person who has pressed preset massage button 100_1 may increase the intensity of the massage felt at the foot portion **46** by pressing the button **104** one time. Preferably, buttons **102**, **104** are respectively labeled "HEAD" and "FOOT".

The second group of buttons **74** also includes a head massage motor stop button **106** and a foot massage motor stop button **108**. The buttons **106**, **108** both override any massage mode presently being controlled by the controller unit **48**. More specifically, the head massage motor stop button **106** causes the controller unit **48** to provide the head massage signal as the head massage motor "off" signal. Likewise, when the user presses the foot massage motor stop button **108**, the controller unit **48** provides the foot massage signal as the foot massage motor "off" signal. Additionally, the second group of buttons **74** includes a reset button **110** which causes all massage motors to stop and returns the bed assembly **20** to a level position. Hence, a more capable user may initiate one of the four preferred massage modes, adjust the speed of the massage motors **52**, **54**, or stop the massage as desired by simply sliding back the face cover **58** to access the second group of buttons **74**. A more detailed description of the controller unit **48** and the remote control unit **50** follows.

FIG. **11** shows a functional block diagram of the simplified remote control unit **50**. The plurality of buttons are fitted within the housing **56** in the form of a key pad **112**. A bed address selector switch **114** and the key pad **112** both provide outputs to an encoder **116**. The key pad **112** outputs user input signals **118** from both the first and second groups of buttons **72**, **74**. The user input signals **118** generated by the first group of buttons **72** include the raise head portion signal, the lower head portion signal, the raise foot portion signal, the lower foot portion signal, the bed position preset signal, and the stored massage signal. The user input signals generated by the second group of buttons **74** include the head massage motor speed signal, the foot massage motor speed signal, and the massage motor's preset signal. The output **120** of the bed address switch **114** and the user input signals **118** are received by the encoder **116** which generates an encoded signal **122**. The remote control unit **50** additionally includes a transmitter **124** which receives the encoded signal **122** and transmits a modulated encoded signal **126**. The transmitter **124** may include a conventional FM radio transmitter with antenna **128** or a conventional infrared emitting device **130**.

The bed address information provided at output **120** allows more than one articulated bed assembly **20** to be used within close proximity. The bed controller unit **48** preferably includes a corresponding bed address switch, To this end, the preferred encoder **116** is a C-MOS Motorola MC145026 encoder chip of Motorola's commonly utilized MC145026/27 encoder/decoder pair. Accordingly, the bed controller unit **48** which receives and decodes the user input signals **118**, as provided to it by the remote control unit **50**, preferably includes a Motorola MC145027 decoder chip. As may be readily appreciated, other encoder/decoder pairs or functionally equivalent circuitry may be employed in lieu of the preferred encoder/decoder pair.

FIG. **12** shows a simplified block diagram of the bed controller unit **48**. Additionally, FIG. **12** shows that the controller unit **48** provides the head elevation motor **32** with the head elevation signal **132**, the foot elevation motor **34** with the foot elevation signal **134**, the head massage motor **52** with the head massage signal **136**, and the foot massage motor **54** with the foot massage signal **138**. In the illustrated embodiment, the bed controller unit **48** includes a receiver **140**, a decoder **142** and logic circuitry **144**. The receiver **140** receives and demodulates the modulated encoded signal **126** from the remote control unit **50** to provide the encoded signal **122** to the decoder **142**. The decoder **142** additionally receives a bed address switch input as discussed above, and, accordingly, only decodes user input signals which are sent by the remote control unit **50** whose address matches that of the control unit **48**. The decoder **142** provides decoded user input signals **123** to the logic circuitry **144** which, in turn, generates the head elevation signal **132**, the foot elevation signal **134**, the head massage signal **136**, and the foot massage signal **138**. The logic circuitry **144** may alternatively be realized in the form of a processor and/or may include timers for determining the duration of the above-described preset massages.

A further aspect of the present invention is conceptually illustrated in FIGS. **14** and **15**, the former illustrating that a member vibrating at a fundamental frequency exhibits vibratory harmonic components. It has been observed that the predetermined low, medium and high head massage motor frequencies and the predetermined low, medium and high foot massage motor frequencies may be controlled by the logic circuitry **144** such that the controller unit **48** provides a beat frequency vibration effect between the head portion **40** and the foot portion **46** of the bed assembly **20**. By appropriately selecting the aforementioned frequencies, a harmonic of the head massage motor **52** is close enough to the fundamental frequency of the foot massage motor **54** (or vice versa) thereby providing a beat frequency vibration effect noticeable to the user. For example, FIG. **15** shows a first frequency f_1 corresponding to a harmonic of the head massage motor **52** and a second frequency f_2 corresponding to the fundamental frequency of the foot massage motor **54**. The additive effect of f_1 and f_2 which are close in frequency

results in the beat frequency vibration effect shown in the plot designated as f_1+f_2.

Those skilled in the art will appreciate that various adaptations and modifications of the just described preferred embodiment can be configured without departing from the scope and spirit of the invention. Therefore, it is to be understood that, within the scope of the appended claims, the invention may be practiced other than as specifically described herein. For example, the simplified remote control unit may be readily modified for the purpose of controlling a television, a compact disk player, or the like.

I claim:

1. An adjustable massage bed assembly, comprising:

a head motor for controllably raising and lowering a head section of a mattress;

a foot motor for controllably raising and lowering a foot section of the mattress;

a vibratory motor for imparting a massaging action to a portion of the mattress;

and

a handheld control unit including first and second mechanisms for controlling operations of said head and foot motors, and a third mechanism for controlling an operation of said vibratory motor;

wherein said third mechanism when actuated also stops any operation of said head and foot motors as a safety feature.

2. The bed assembly of claim 1 wherein said vibratory motor defines a head vibratory motor and said mattress portion defines a mattress head portion, and further comprising a foot vibratory motor for imparting a massaging action to a foot portion of the mattress, and said control unit includes a fourth mechanism for controlling an operation of said foot vibratory motor, wherein said fourth mechanism when actuated also stops any operation of said head and foot motors as a safety feature.

3. The bed assembly of claim 2 wherein said first, second, third and fourth mechanisms comprise respectively first, second, third and fourth depressible buttons.

4. The bed assembly of claim 1 wherein said control unit is a wireless remote handheld control unit.

5. The bed assembly of claim 1 wherein said first mechanism controls operation of said head motor but not said foot motor and said second mechanism controls operation of said foot motor but not said head motor.

6. The bed assembly of claim 1 wherein said first mechanism operates both said head and foot motors to cause the mattress to assume a first predetermined mattress head-foot configuration, and said second mechanism operates both said head and foot motors to cause the mattress to assume a different second predetermined mattress head-foot configuration.

7. The bed assembly of claim 1 wherein said control unit includes first and second groups of control buttons and a slidable cover which slides between an open position operatively exposing both said first and second groups and a cover position operatively covering said second group and operatively exposing said first group.

8. The bed assembly of claim 1 wherein said control unit includes a fourth mechanism which when actuated causes said vibratory motor to sequentially cycle through predetermined low, medium and high motor frequencies.

9. The bed assembly of claim 1 further comprising said vibratory motor defining a first vibratory motor, said mattress portion defining a mattress first portion, a second vibratory motor for imparting a massaging action to a mattress second portion, said control unit including a stored massage mechanism which when actuated causes said first vibratory motor to automatically vibrate at a first predetermined frequency and said second vibratory motor to automatically vibrate at a second predetermined frequency.

10. The bed assembly of claim 8 wherein said fourth mechanism when actuated stops any ongoing operation of said head and foot motors as a safety feature of said bed assembly.

11. The bed assembly of claim 1 wherein said handheld control unit includes a preset position mechanism which when actuated causes at least one of said head and foot motors to operate and move at least one of the head and foot sections to respective predetermined positions, both angled relative to a horizontal.

12. The bed assembly of claim 11 wherein said preset position mechanism when actuated stops any ongoing operation of said head and foot motors as a safety feature of said bed assembly.

13. The bed assembly of claim 1 wherein said first, second and third mechanisms comprise depressible buttons on a face of said handheld control unit.

14. The bed assembly of claim 7 wherein said slidable cover is manually slidable longitudinally relative to said control unit by a user between the open and cover positions.

* * * * *

Exhibit 2

US006684423B2

(12) **United States Patent**
Godette

(10) **Patent No.: US 6,684,423 B2**
(45) **Date of Patent: Feb. 3, 2004**

(54) **MASSAGE MOTOR MOUNTING FOR BED/CHAIR**

(75) Inventor: **Robert G. Godette**, Midway City, CA (US)

(73) Assignee: **L&P Property Management Company**, South Gate, CA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 36 days.

(21) Appl. No.: **09/747,870**

(22) Filed: **Dec. 22, 2000**

(65) **Prior Publication Data**

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(52) **U.S. Cl.** **5/600**; 5/933; 5/617
(58) **Field of Search** 5/600, 613, 617, 5/618, 933; 601/84, 85, 87, 89, 90, 91

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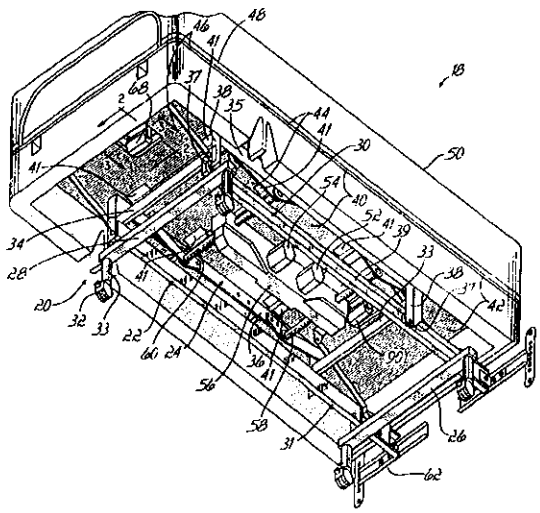
(57) **ABSTRACT**

An adjustable bed having a bed frame and a center support section supported by the bed frame. A second support section has one end pivotally attached to one end of the center support section, and the second support section has an opening therethrough. A massage motor assembly has a housing mounted to the second support section over the opening. A massage motor is disposed in the housing, and a resilient material is disposed in the housing between the massage motor and the housing. Enclosing the massage motor in the resilient material reduces its operational noise and permits the massage motor to move in its natural orbital motion.

14 Claims, 2 Drawing Sheets



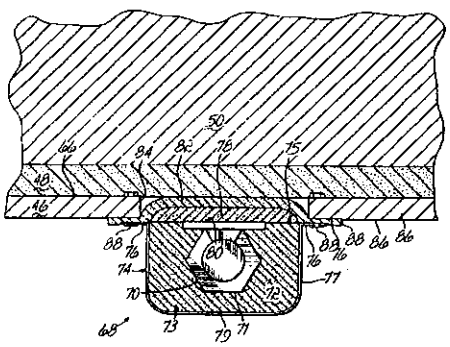
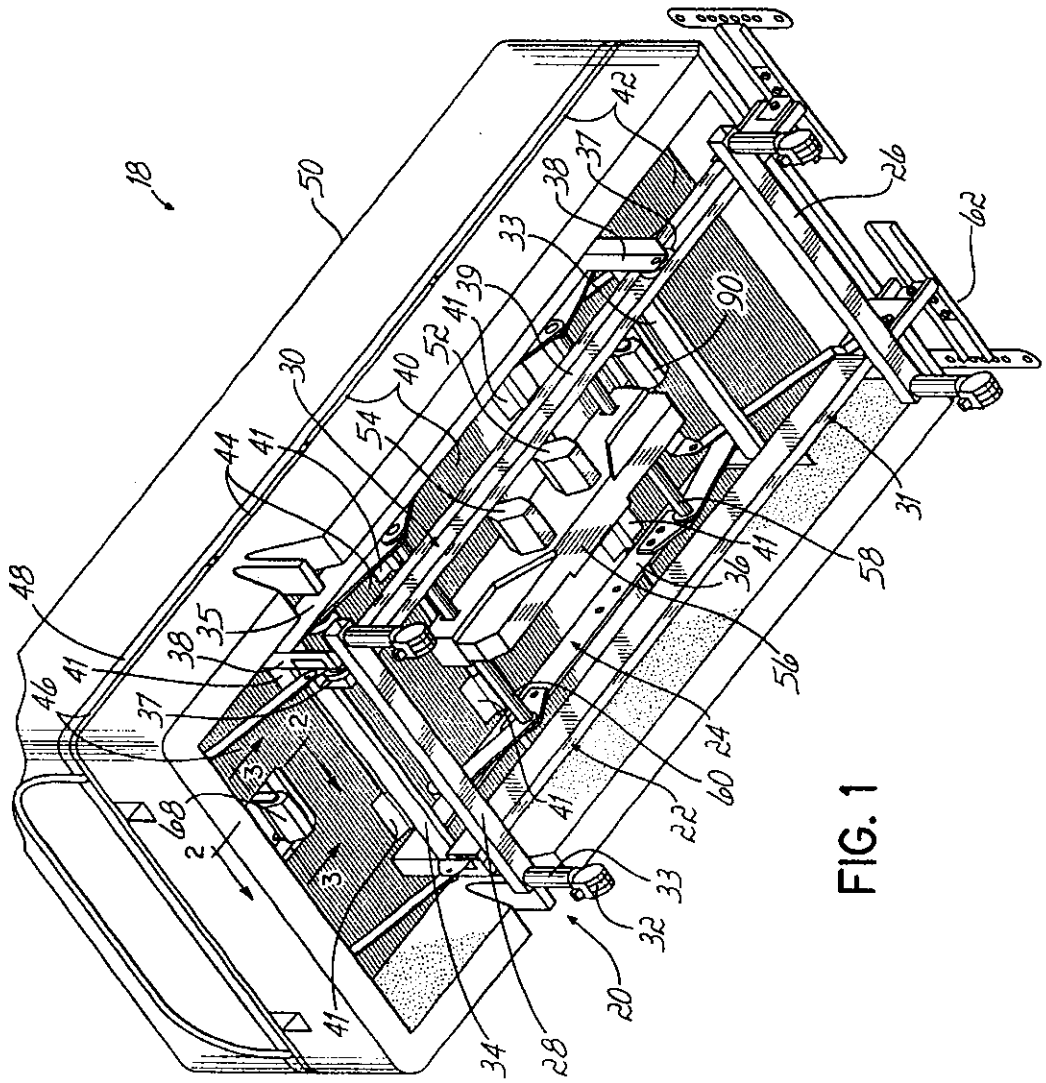


EXHIBIT 2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48
35
38
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46
41
37
2
3
68
2
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28
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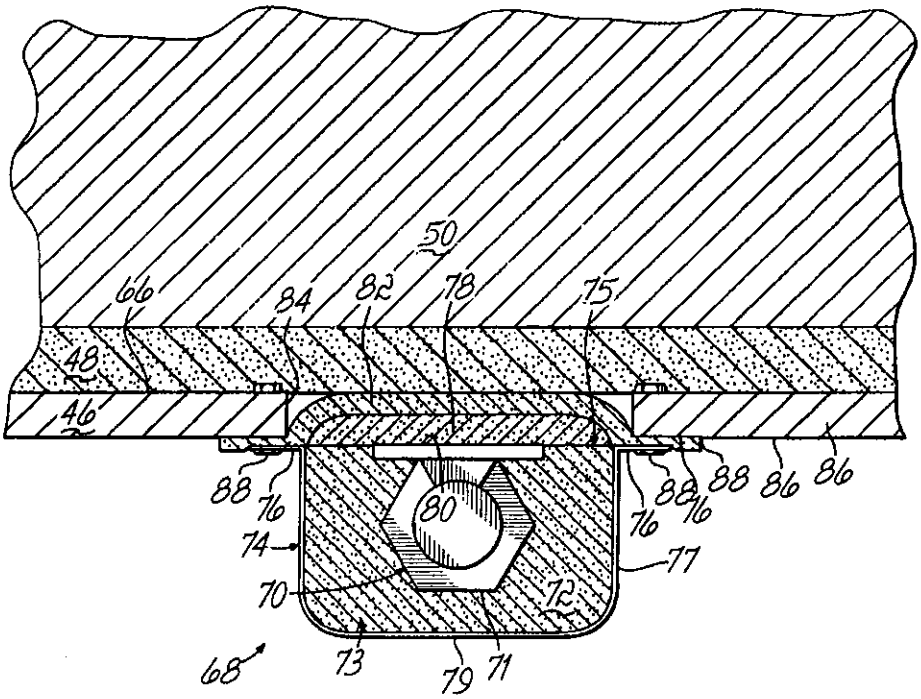
FIG. 1


50
66
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86

FIG. 2

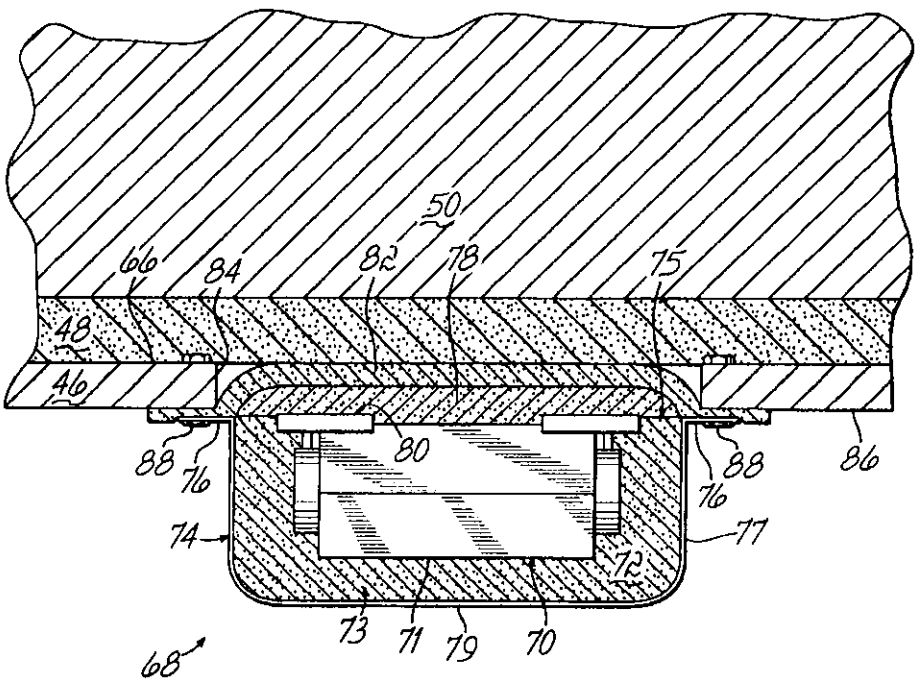
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FIG. 3

MASSAGE MOTOR MOUNTING FOR BED/CHAIR

FIELD OF THE INVENTION

This invention relates generally to beds and more particularly, to improvements to beds having massage motors.

BACKGROUND OF THE INVENTION

Adjustable beds were originally designed principally for use by patients who had to spend long periods of time in bed for reasons of health, injury, etc. However, more recently, adjustable beds are being used in residential environments by users who have no health or physical impairment. An increasing number of people place televisions and other entertainment devices in the bedroom, and more time is spent lounging in bed. Hence, the bed, and in particular, an adjustable bed, is considered by many users an alternative piece of leisure furniture.

One recent development in adjustable beds is the development of a "wallhugger" adjustable bed. The wallhugger adjustable bed maintains the user in the same position with respect to adjacent appliances and furniture as the head portion of the bed is moved between flat and elevated positions. As the market for leisure beds grows, there is a continuing effort by suppliers to provide leisure beds that are more comfortable, have more options, for example, massage capabilities, more sophisticated controls, and are more affordable.

Almost all adjustable beds utilize one or more massage motors which are controllable by a user to provide a massaging action to the user. In one embodiment, a massage motor is rigidly connected to an underside of a rigid platform, for example, a head board or a foot board, that is hinged to a center board or platform. Further, the whole articulated platform normally supports a mattress base, for example, a foam pad, over which is placed a mattress. Thus, any vibration applied to the underside of the head board must vibrate the whole head board; and further, the vibration is partially absorbed and attenuated by the soft materials in the mattress base and the mattress. The resulting or net vibration applied to a user lying on the mattress is often substantially less than desired. Further, with such a massage motor mounting, the noise caused by the massage motor operation can be objectionable.

In other designs, the mattress base is a foam pad approximately 4 inches thick; and the massage motor is inserted into a slit, so that it is fully contained within the mattress base. While such a design is relatively quiet, the massage action of the massage motor is attenuated by the relatively thick foam of the mattress base.

Thus, there is a need for an improved structure for more effectively mounting a massage motor that provides a more desirable and penetrating massaging action to a user lying on the bed.

SUMMARY OF THE INVENTION

The present invention provides a bed having a quieter operation and an improved massage capability, thereby increasing the satisfaction of the user with the bed. The massage motor mounting of the present invention is especially useful on beds having a relatively thin mattress base. Further, the massage motor mounting of the present invention is less expensive than known massage motor mountings for beds having a thin mattress base.

According to the principles of the present invention and in accordance with one embodiment, the present invention provides an adjustable bed having a bed frame and a center support section supported by the bed frame. A second support section has one end pivotally attached to one end of the center support section, and the second support section has an opening therethrough. A massage motor assembly has a housing mounted to the second support section over the opening. A massage motor is disposed in the housing, and a resilient material is disposed in the housing between the massage motor and the housing.

Enclosing the massage motor with the resilient material substantially reduces the operational noise of the massage motor. Further, the massage motor is able to move in its orbital motion within the housing and into the opening in the second support section, thereby imparting an effective massage action to the user. In addition, the mounting of the massage motor assembly does not in any way adversely impact the feel of the bed to a very heavy user.

In accordance with one aspect of the invention, the resilient material is a flexible foam material which adds very little cost to the massage motor assembly.

These and other objects and advantages of the present invention will become more readily apparent during the following detailed description taken in conjunction with the drawings herein.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 a perspective view of an adjustable bed having a massage motor mounted in accordance with the principles of the present invention.

FIG. 2 is a partial cross-sectional view taken along line 2—2 of FIG. 1 and illustrates a massage motor mounting in accordance with the principles of the present invention.

FIG. 3 is a partial cross-sectional view taken along line 3—3 of FIG. 1 and illustrates a massage motor mounting in accordance with the principles of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

Referring to FIG. 1, an adjustable bed **18** includes a bed frame **20** comprised of a lower frame **22** and an upper frame **24** movably mounted on the lower frame **22**. The lower frame **22** has head and foot end rails **26, 28**, respectively, and left and right side rails **30, 31**, respectively. The rails **26–31** are joined at their ends to form a generally rectangular frame section. Each of the casters **32** includes a caster bracket **33** for receiving the stem of the caster (not shown) that supports the adjustable bed **18** on the floor. The upper frame **24** includes a head rail **33**, a foot rail **34** and left and right side rails **35, 36**, respectively. The rails **33–36** are rigidly connected at their ends with fasteners to form the generally rectangular upper frame **24**. The upper frame side rails **35–36** are made of angle stock, and the upper frame **24** is movably mounted on the lower frame **22** by four wheels **37** which are rotatably mounted to the ends of legs **38**. The wheels **37** ride in C-shaped channels or tracks **39** forming the left and right lower frame side rails **30, 31**, respectively.

In a known manner, a center support board or platform **40** is connected to the upper frame **24**, and a head support board or platform **42** is pivotally connected to a head end of the center supporting platform **40** with hinges **41**. A thigh support board or platform **44** is pivotally connected to a foot end of the center support platform **40** by hinges **41**; and a foot supporting board or platform **46** is pivotally connected

to a foot end of the thigh supporting platform **42** by hinges **41**. The supporting platforms **40–46** may be made from any desired material that is capable of properly supporting a user on a mattress, for example, a plywood or OSB material. The supporting platforms **40–46** are normally 0.625 inch thick but may be other thicknesses as is required. A mattress base **48**, for example, a one inch foam pad, is mounted over and covers the head, center, thigh and foot support boards **40–46**. Normally, the boards **40–46** and mattress base **48** are enclosed within a covering (not shown). A mattress **50** is then laid over the mattress base **48**.

Head and thigh motors **52, 54**, respectively, are mounted to a drive assembly **56** which mechanically couples the head and thigh motors **52, 54** to respective head and thigh torque tubes **58, 60** in a known manner. Operating the head motor **52** rotates the torque tube **58** and raises the head platform **42**. With the bed of FIG. **1**, as the head platform **42** is raised, the upper frame **24** translates toward the head end the bed; and the head platform **42** remains close to the headboard **117**. Operating the thigh motor **54** rotates the thigh torque tube **60** and raises the junction of the thigh and foot platforms **44, 46**, respectively.

Referring to FIGS. **2** and **3**, the mattress base **48** lays over an upper surface **66** of the support platform **46**. The mattress base **48** can be made of any soft, flexible material such as a fiber or foam, for example, a fire retardant, urethane foam of about 0.500–3 inches thick, for example, 1 inch thick. The foam mattress base **48** has a typical density of about 1.3–2.3 pounds per cubic foot, for example, 1.8 pounds per cubic foot and a typical I.L.D. of about 30–40 pounds per square inch ("psi"), for example, 35 psi.

The adjustable bed **18** has a massage motor assembly **68** mounted to the foot platform **46**. The massage motor assembly **68** includes a massage motor **70** having a massage motor housing **71** surrounded by a foam enclosure or cocoon **73** disposed within an outer housing **74**. The massage motor **70** is an electric DC motor that has a light weight, for example, molded plastic motor housing **71**, and there are no moving massage motor parts outside the housing motor **71**. Massage motors having a heavier metal housing may also be used and are commercially available from Hankscraft of Reedsburg, Wis. More specifically, the outer housing **74** is a generally rectangular enclosure having four sides **77**, a top **79** and an upper opening **75**. The massage motor housing **71** is fully encased within a first foam inner jacket **72**. The assembly of the foam inner jacket **72** and motor **70** is disposed through an opening **75** of the outer housing **74**. The outer housing **74** may be made of any rigid material, for example, metal, plastic, etc., that is molded, formed or fabricated to the desired size. The housing includes a mounting flange **76** located on its peripheral edge.

A foam top jacket **78** is placed across the opening **75** of the outer housing **74** and over a bottom side **80** of the massage motor housing **71**. A foam pad **82** is placed over the top foam jacket and extends outward over the mounting flange **76**. Thus, the housing **71** of the vibrator motor **70** is totally encased by, and floats within, the foam enclosure **73** formed by the respective inner and top jackets **72, 78**. The foam inner and top jackets **72, 78** and foam pad **82** can be made of any resilient material, for example, substantially the same flexible foam used for the mattress base **48**.

The assembly of the housing **71** of the motor **70**, outer housing **74** and foam pad **82** is placed over an opening **84** within the foot platform **46**. In that position, the mounting flange **76** compresses a portion of the foam pad **82** a lower surface **86** of the foot platform **46**. Fasteners **88** extend through against contiguous holes in the mounting flange **76**, foam pad **82** and foot platform **46**. The fasteners **88** may be any suitable fastener, for example, a threaded screw or bolt and a mating nut. The fasteners **88** are tightened so that the foam pad **82** provides little, if any, resiliency to the mounting of the massage motor assembly **68** to the foot platform **46**.

In FIGS. **2** and **3**, the mounting of the massage motor assembly **68** is described with respect to the foot platform **46**. As will be appreciated, the massage motor assembly **90** (FIG. **1**) and its mounting with respect to the head platform **40** is identical to that described with respect to massage motor assembly **68** in FIGS. **2** and **3**. Thus, one or more massage motor assemblies **68** as illustrated in FIGS. **2** and **3** may be used with respect to any of the bed platform sections **40–46**.

In use, the mattress base **48** functions to dampen the feeling of the irregularities on the top surface **66** (FIGS. **2** and **3**) caused by fasteners, for example, fasteners **88** and the fasteners used to connect the hinges **41** (FIG. **1**) to the supporting platforms **40–46**. As shown in FIGS. **2** and **3**, when the vibrator motor **70** is turned off, the massage motor **70** is principally below the platform **46** and outside the opening **84**. When the message motor **70** is turned on, the whole motor **70** including the massage motor housing **71** is able to move in its orbital motion within the foam enclosure **73**. The foam enclosure **73** functions first to attenuate the noise of the vibrating motor **70**. Further, the foam enclosure **73** can also attenuate the vibrating action of the motor **70** and change the "feel" of the massaging action imparted by the motor **70**. Thus, the degree of noise attenuation and "feel" of the massaging action can be tuned by using foams in the enclosure **73** of different densities. Being placed over the opening **84** in the foot platform **46**, as the motor **70** moves through its orbital motion, it moves partially into the opening **84** within the platform **46**. Such motion is effective to transfer a massaging action to a user lying on the mattress **50**.

The massage motor mounting of the present invention provides numerous advantages. First, the operation of the massage motor **70** is very quiet. Second, the massage motor assembly **68** can be used with a relatively thin, for example, one inch thick, mattress base **48**. Third, the massage motor assembly **68** permits the massage motor to move through its orbital motion, and a very effective, penetrating massage action is transferred to the user.

While the invention has been illustrated by the description of one embodiment and while the embodiment has been described in considerable detail, there is no intention to restrict nor in any way limit the scope of the appended claims to such detail. Additional advantages and modifications will readily appear to those who are skilled in the art. For example, the massage motor assembly **68** of FIGS. **2** and **3** are described with respect to a "wallhugger" adjustable bed. As will be appreciated, the same massage motor assembly **68** may be applied to other adjustable bed designs as well as nonadjustable bed designs. Further, the massage motor assembly **68** may also be used with recliner chairs and couches as well as other leisure furniture.

Therefore, the invention in its broadest aspects is not limited to the specific detail shown and described. Consequently, departures may be made from the details described herein without departing from the spirit and scope of the claims which follow.

What is claimed is:

1. An adjustable bed comprising:

a bed frame;

a rigid center support section supported by the bed frame;

a rigid second support section having one end pivotally attached to one end of the rigid center support section, the rigid second support section having an opening extending therethrough between upper and lower sides;

a layer of flexible material disposed on upper sides of the rigid center support section and the rigid second support section; and

a massage motor assembly comprising

an outer housing mounted to the lower side of the rigid second support section, the outer housing having an opening contiguous with the opening on the lower side of the rigid second support section,

a massage motor having a massage motor housing disposed in the outer housing, there being no moving massage motor parts outside the massage motor housing, and

a resilient material disposed in the outer housing between the massage motor housing and the outer housing, the massage motor housing not directly contacting either the outer housing or the rigid second support section, the resilient material reducing an operational noise of the massage motor.

2. The adjustable bed of claim 1 wherein the massage motor being capable of moving through an orbital motion within the outer housing and further, the massage motor capable of moving into the opening of the second support section, thereby imparting a massaging action to the user.

3. The adjustable bed of claim 1 further comprising a mattress base having a thickness of approximately one inch covering the center and second support sections.

4. The adjustable bed of claim 1 wherein the resilient material comprises a resilient inner jacket disposed around the massage motor housing within the outer housing.

5. The adjustable bed of claim 4 wherein the outer housing has an opening for receiving the inner jacket and massage motor.

6. The adjustable bed of claim 5 wherein the resilient material further comprises a resilient top jacket disposed within the opening in the outer housing and covering the massage motor housing.

7. The adjustable bed of claim 6 wherein the outer housing further comprises a mounting flange at a periphery of the outer housing for mounting the outer housing to the lower side of the second support member.

8. The adjustable bed of claim 7 wherein the resilient material further comprises a resilient pad extending over the opening of the outer housing and between the mounting flange and the lower side of the second support member, the attachment of the mounting flange to the lower side of the second support member holding the resilient pad in place.

9. The adjustable bed of claim 8 wherein the resilient inner jacket, the resilient top jacket and the resilient pad is a foam material.

10. The adjustable bed of claim 1 wherein the second support section comprises:

a rigid thigh support section having one end pivotally connected to the opposite end of the center support section; and

a rigid foot support section having one end pivotally connected to an opposite end of the thigh center support section and the opening extends between upper and lower sides of the foot support section, the massage motor assembly being mounted to the lower side of the foot support section.

11. The adjustable bed of claim 1 wherein the second support section is a head support section and the opening extends between upper and lower sides of the head support section, the massage motor assembly being mounted to the lower side of the head support section.

12. The adjustable bed of claim 1 further comprising:

a rigid thigh support section having one end pivotally connected to the opposite end of the center support section;

a rigid foot support section having one end pivotally connected to an opposite end of the thigh support section, the foot support section having an opening extending therethrough between upper and lower sides; and

a second massage motor assembly comprising

a second outer housing mounted to the lower side of the foot support section over the opening of the foot support section,

a second massage motor having a second massage motor housing disposed in the outer housing, there being no moving massage motor parts outside the second massage motor housing, and

a resilient material disposed in the outer housing between the second massage motor housing and the outer housing, the second massage motor housing not directly contacting either the outer housing or the foot support section, the resilient material reducing an operational noise of the second massage motor.

13. A bed comprising:

a bed frame;

a rigid support section having an opening extending therethrough between upper and lower sides;

a layer of flexible material disposed on an upper side of the rigid support section: and

a massage motor assembly comprising

an outer housing mounted to the lower side of the rigid support section, the outer housing having an opening contiguous with the opening on the lower side of the rigid support section,

a massage motor having a massage motor housing disposed in the outer housing, there being no moving massage motor parts outside the massage motor housing, and

a resilient material disposed in the outer housing between the massage motor housing and the outer housing, the massage motor housing not directly contacting either the outer housing or the support section, the resilient material reducing an operational noise of the massage motor.

14. The bed of claim 13 further comprising a mattress base having a thickness of approximately one inch covering the support section.

* * * * *

UNITED STATES PATENT AND TRADEMARK OFFICE

CERTIFICATE OF CORRECTION

PATENT NO. : 6,684,423 B2
DATED : February 3, 2004
INVENTOR(S) : Robert G. Godette

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

Column 2,
Line 30, "Fig. 1 a perspective" should read -- Fig. 1 is a perspective --.

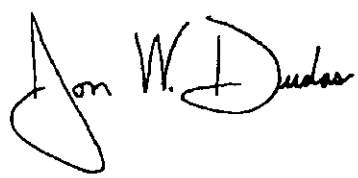
Column 3,
Line 18, "head end the bed" should read -- head end of the bed --.
Line 66, "pad 82 a lower" should read -- pad 82 against a lower --.

Column 4,
Line 1, "through against contiguous" should read -- through contiguous --.
Line 53, "restrict nor in any way" should read -- restrict or in any way --.
Line 57, "are described" should read -- is described --.

Column 5,
Line 57, "the resilient pad is" should read -- the resilient pad are --.

Signed and Sealed this

Eighteenth Day of May, 2004



JON W. DUDAS
Acting Director of the United States Patent and Trademark Office

Exhibit 3

US005235258A

United States Patent [19]

Schuerch

[11] Patent Number: 5,235,258

[45] Date of Patent: Aug. 10, 1993

[54] **REMOTELY CONTROLLED ARTICULATED BED**

[75] Inventor: **F. Willy Schuerch, Biel, Switzerland**

[73] Assignee: **Santino Antinori, Tampa, Fla. ; a part interest**

[21] Appl. No.: **925,325**

[22] Filed: **Aug. 6, 1992**

Related U.S. Application Data

[63] Continuation of Ser. No. 675,829, Mar. 27, 1991, abandoned.

[51] **Int. Cl.**[5] **H04Q 7/00; A61G 7/015**

[52] **U.S. Cl.** **318/16; 5/616**

[58] **Field of Search** 5/11, 60, 66, 67, 68, 5/446, 509, 69; 318/16, 114, 460, 119, 120, 128, 129, 130, 134, 434; 340/825.75, 825.77

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Primary Examiner—Bentsu Ro

Attorney, Agent, or Firm—Diller, Ramik & Wight

[57] **ABSTRACT**

An articulated bed wherein all power signals within the mattress or supporting frame are maintained at 24 volt DC or less. Both body supporting surface manipulating motors and vibratory motors are accommodated. Remote control of all motors is provided, with control signals being processed as a function of a key in order to minimize the likelihood of instructions for one bed being intercepted and acted upon by another bed within range of the remote control device. A plurality of discrete vibration levels are accommodated through use of pulse width modulation control signals. Overload operation of the lifting motors is sensed, and the motors are immediately shut down regardless of whether contrary instructions are currently prevailing or being received.

35 Claims, 6 Drawing Sheets

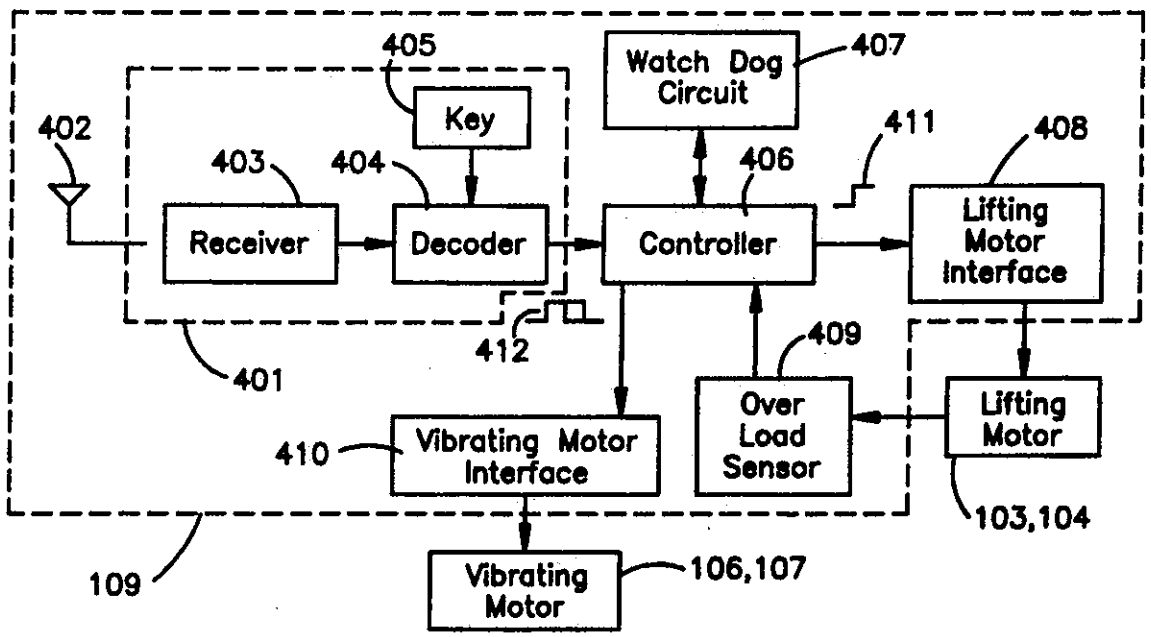


FIG. 2

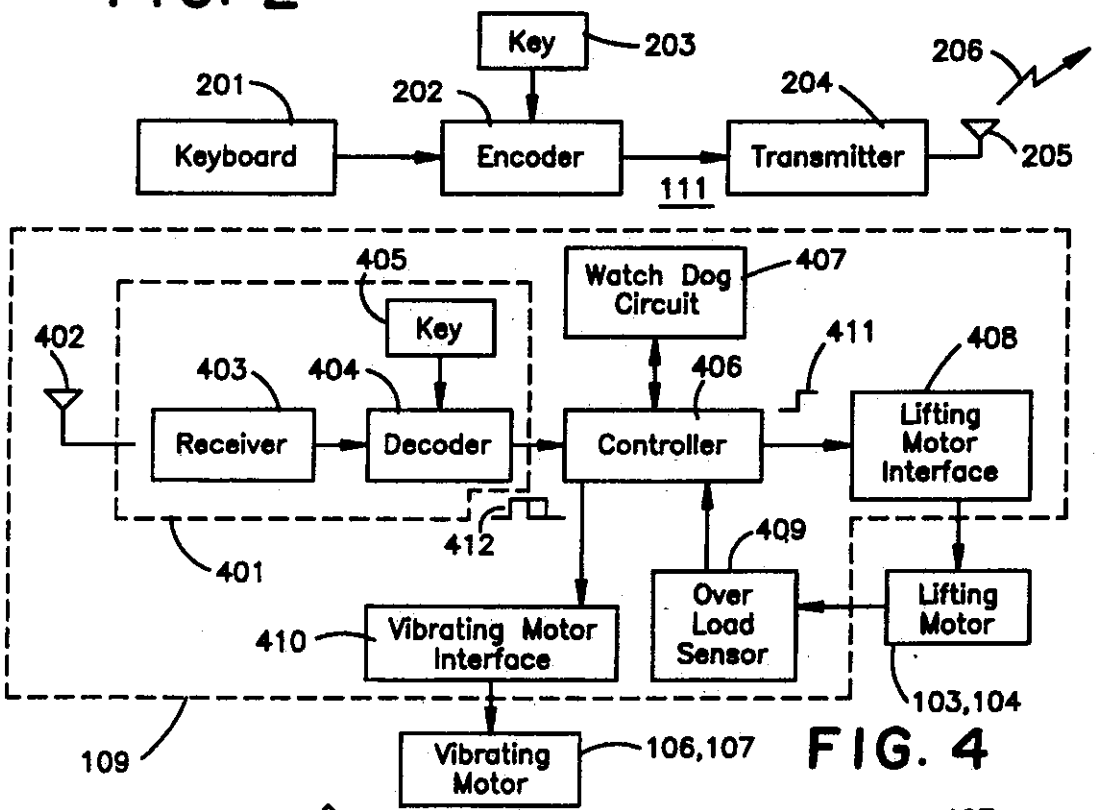


FIG. 4

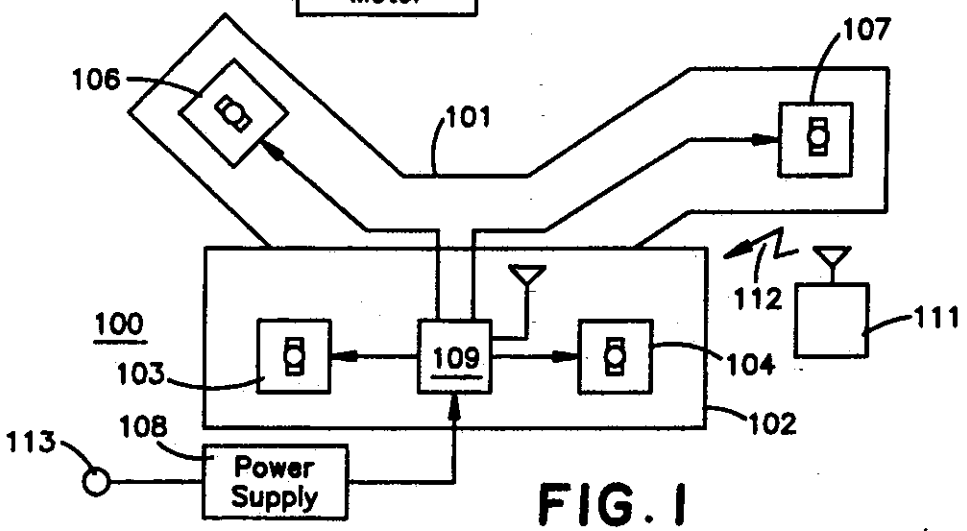


FIG. 1

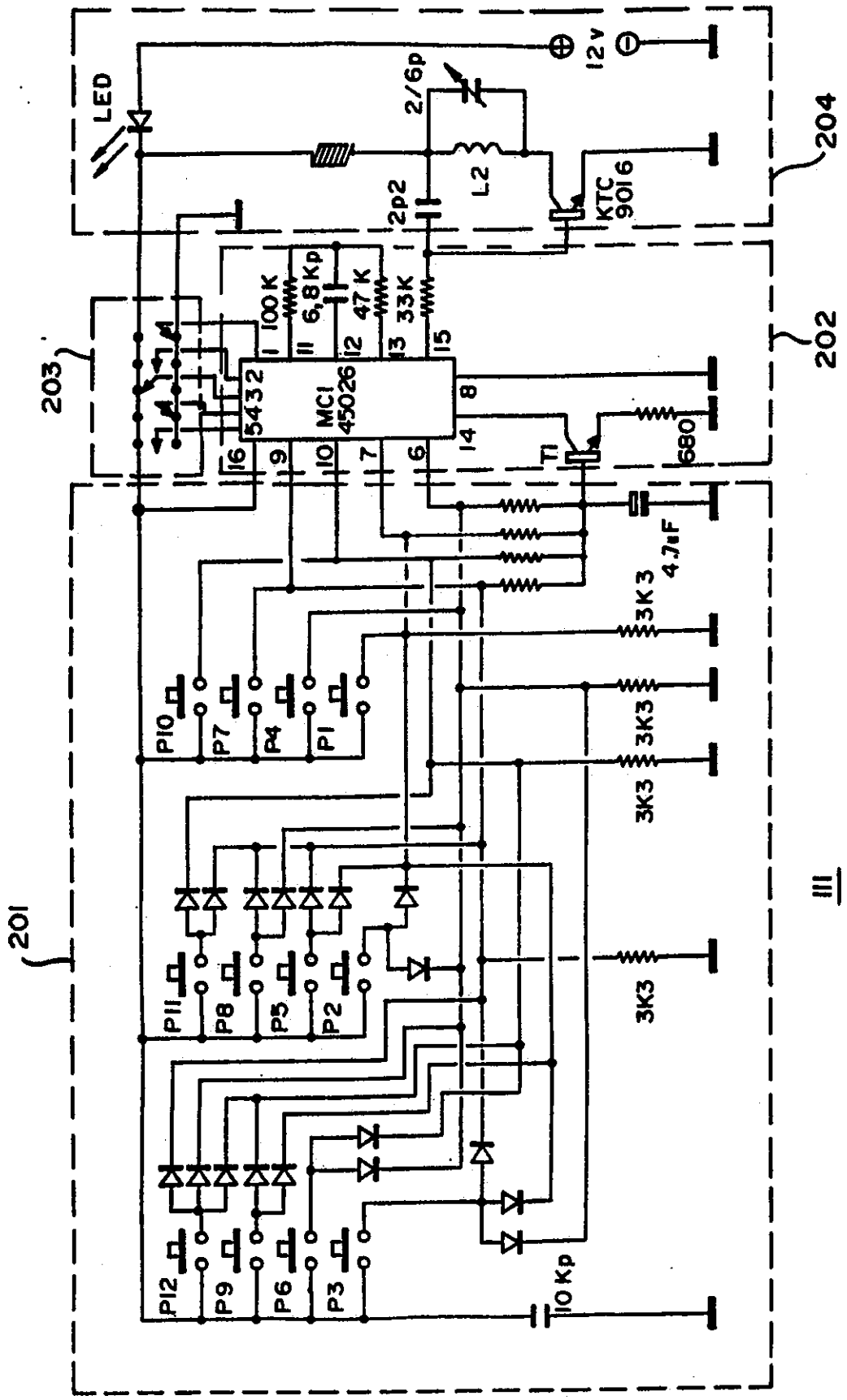
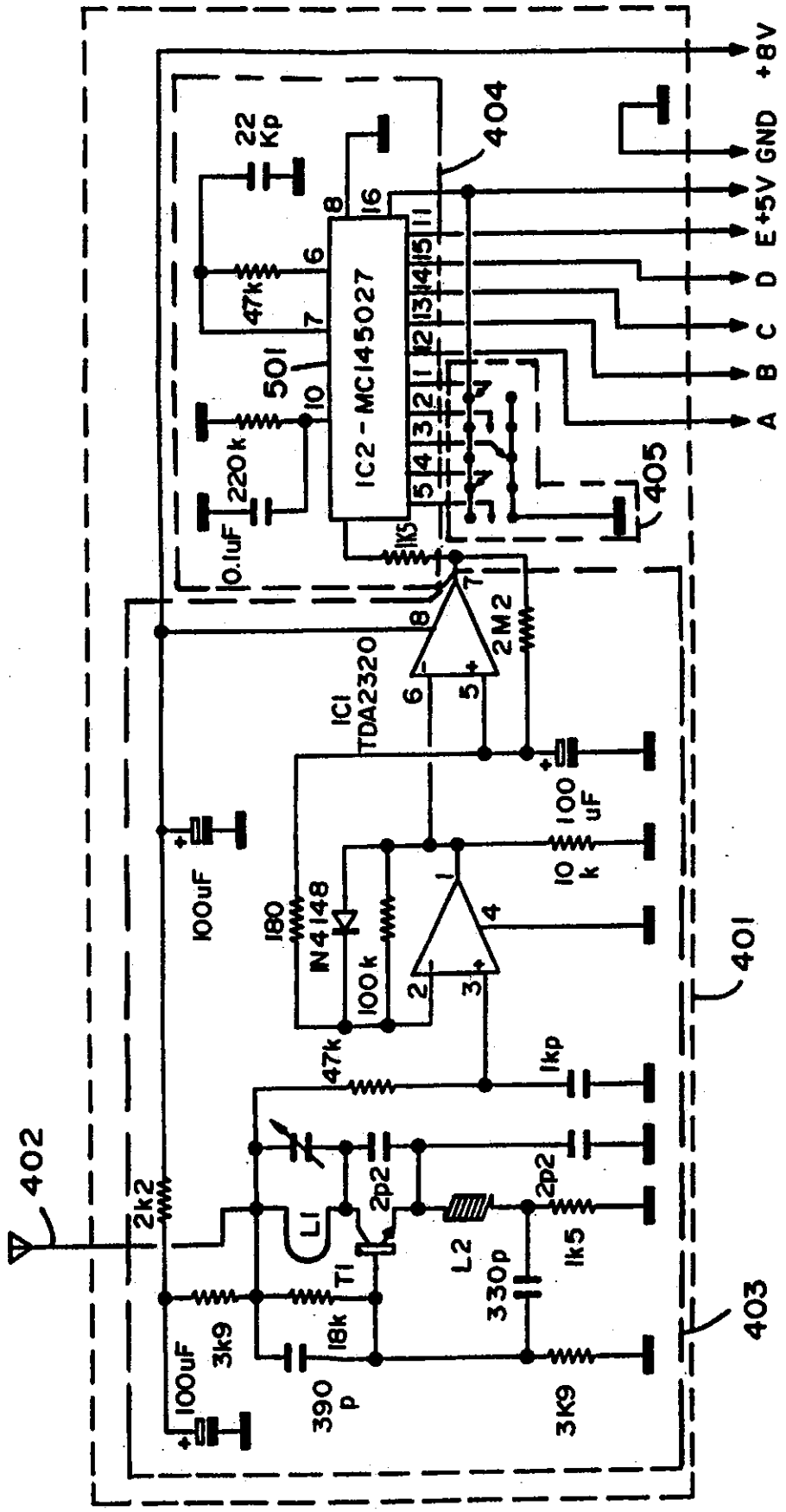


FIG. 3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47k
501
220k
0.1uF
1K5
2M2
100 uF
10 k
180
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1kp
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L1
T1
L2
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18k
3k9
390 p

FIG. 5

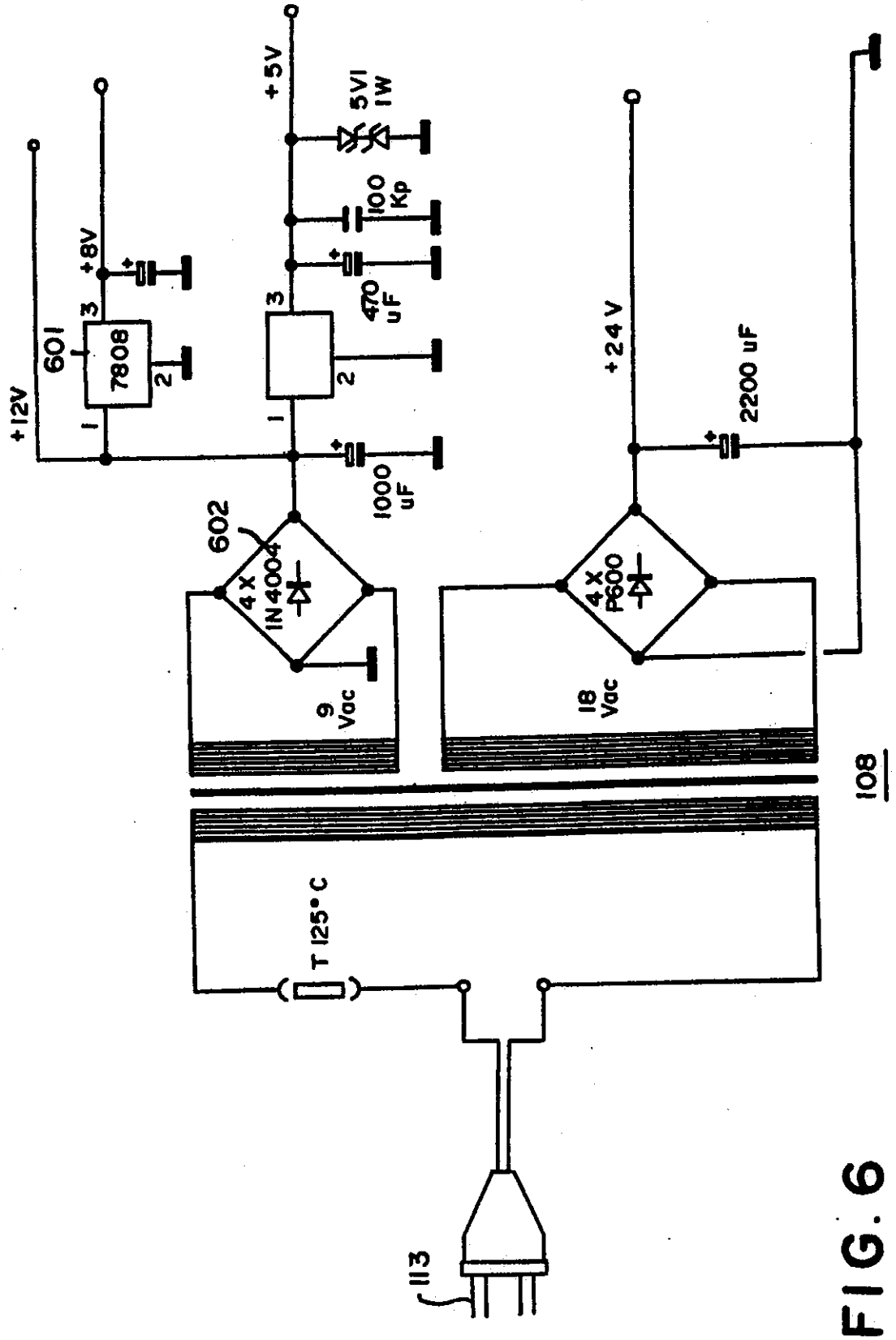

FIG. 6

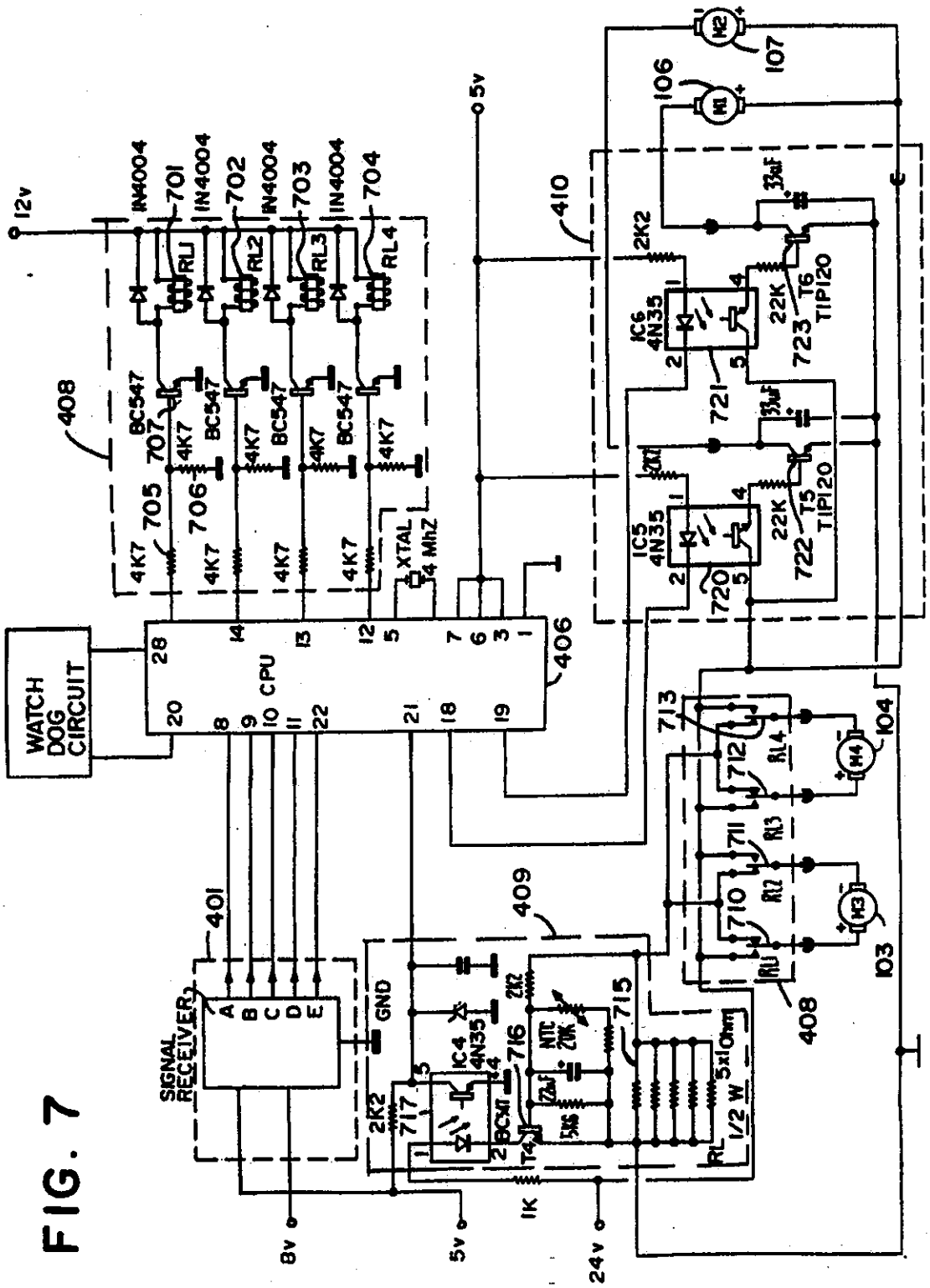

FIG. 7

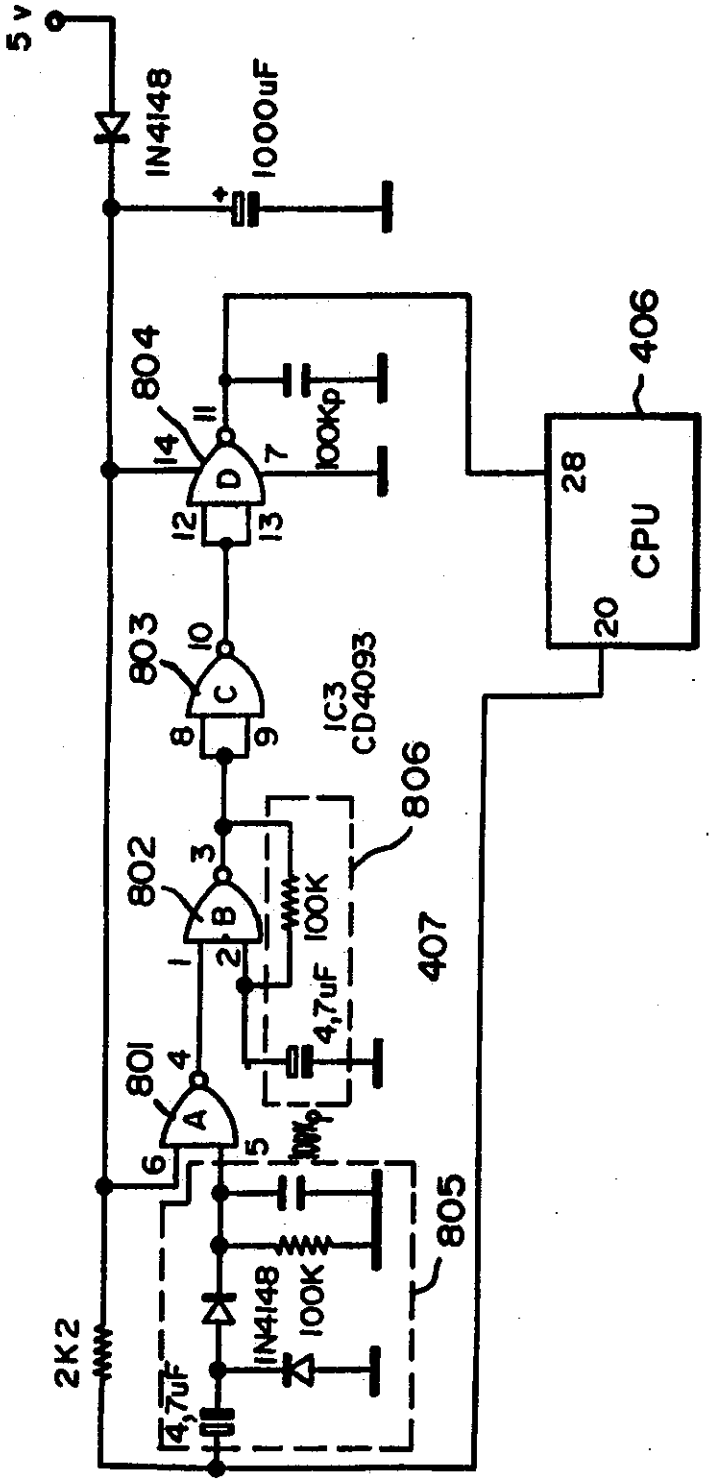

FIG. 8

REMOTELY CONTROLLED ARTICULATED BED

This application is a continuation of application Ser. No. 07/675,829, filed Mar. 27, 1991, now abandoned.

RELATED APPLICATIONS

This application relates generally to earlier filed U.S. patent application Ser. No. 07/518,134, filed on May 3, 1990 (abandoned) by Sechrist et al. and entitled Articulated Bed Arrangement.

TECHNICAL FIELD

This invention relates generally to the field of furniture, and more particularly to the field of beds and other sleeping or resting surfaces, and especially to beds having movement inducing or vibratory motors associated therewith.

BACKGROUND OF THE INVENTION

Articulated beds are known in the art. Such beds typically include a frame and a body supporting surface, such as a mattress. Mechanisms are provided to cause portions of the body supporting surface to be moved with respect to one another (such mechanisms are usually either mechanical or electro/mechanical). For example, such mechanisms typically allow the bed to be selectively articulated to position the feet or head of a person lying on the body supporting surface to be disposed in an elevated manner.

The general advantages of such articulated beds are well known. To date, however, such articulated beds have a number of problems associated therewith. For example, such beds are typically operated by accessing a fixed position control panel. This often makes operation of the bed inconvenient, or even impossible, for some users. Remote control devices are of course generally known in the art, and generally do not require a fixed location control panel. Use of such devices with articulated beds gives rise to other problems, however. For example, where a number of articulated beds are located in relatively close proximity to one another (such as in a hospital, nursing home, apartment complex, or the like), remote control signals intended for one bed are likely to be received and acted upon by other beds as well, thereby negating the positive benefits of comfort and/or therapeutic value ordinarily associated with such beds.

Other problems exist as well. Though it is desirable to provide a plurality of motors in such a bed to accommodate a variety of body supporting surface alterations and/or to impart vibration to various parts of the body supporting surface, facilitating easy control of such functions becomes significantly more challenging as the number of functions to be controlled increases. Also, a potentially more serious problem concerns provision of power to the various motors in the bed. Typically, such beds are provided with AC power (50 or 60 Hz at various known voltage levels, such as 110, 120, or 240 volts), and this power is used to power the motors. The use of such levels poses a potential risk to the user of the bed; a short circuit between the user and the AC power, however inadvertent or brief, can be life threatening.

A need therefore exists for an articulated bed that avoids the need for a fixed location control panel, that can be remotely operated without interfering with the operation of other similarly operated beds nearby, that can readily accommodate a relatively generous number and variety of motor control signals in a substantially user friendly manner, and that minimizes the risk of electric shock.

SUMMARY OF THE INVENTION

Accordingly, it is an object of the present invention to provide an improved articulated bed.

It is another object of the present invention to provide an articulated bed that can be operated remotely, without likely interfering with other remotely operated articulated beds in the area.

It is another object of the present invention to provide an articulated bed that will accommodate remote control of a wide variety of motor control functions, both with respect to body supporting surface control and vibration.

It is yet another object of the present invention to provide an articulated bed that can accommodate the integral use of electric motors and other controlling circuitry with a minimized risk of life threatening electrical shock associated therewith.

These and other objects of the invention are achieved through provision of an articulated bed having a body supporting surface, at least one motor for moving the body supporting surface, and a control unit for controlling operation of the motor. The bed also includes a wireless receiver that receives keyed motor control signals as broadcast by a wireless transmitter.

In one embodiment, the wireless transmitter processes the motor control signals as a function of a key, and the wireless receiver processes the received keyed motor control signals as a function of the same key to thereby recover the original motor control signals. So configured, the keyed motor control signals will not be used by another bed that does not use the same key.

In one embodiment, the key can be used as an encryption key to reorganize the control signals pursuant to an appropriate algorithm. In another embodiment, the key can be an ID number or the like that is transmitted with the control signals as an identifier; beds that are not programmed to respond to that particular identifier will ignore the control signals bundled therewith.

In one embodiment, the above elements directly associated with the bed are housed either within the bed frame or the body supporting surface itself, and no element is powered by more than 24 volts DC. An external power supply is also provided, which power supply couples to a standard AC power source. The power supply converts the AC power to the 24 volt DC (or less) power signals required to operate the elements located in the bed itself. Consequently, the risk of life threatening shock to the user is reduced since 24 volts DC constitutes the largest signal available in the bed itself.

In yet another embodiment, the wireless transmitter includes a keypad sufficient to accept input corresponding to a wide variety of instructions, both for body supporting surface movement and for vibration impartation. With respect to the former, controls signals can be generated with respect to movement of particular portions of the body supporting surface, and to the direction of movement. With respect to the latter, control signals can be generated with respect to initiation or termination of vibration in particular portions of the body supporting surface, and with respect to a plurality of discrete levels of vibration.

BRIEF DESCRIPTION OF THE DRAWINGS

These and other attributes of the invention will become more clear upon making a thorough review and study of the following description of a preferred embodiment, particularly when reviewed in conjunction with the drawings, wherein:

FIG. 1 comprises a side elevational diagrammatic depiction of an articulated bed in accordance with the invention;

FIG. 2 comprises a block diagram depiction of a wireless transmitter in accordance with the invention;

FIG. 3 comprises a schematic diagram of the wireless transmitter in accordance with the invention;

FIG. 4 comprises a block diagram depiction of a wireless receiver, control circuits, and controlled elements, all in accordance with the invention;

FIG. 5 comprises a schematic diagram of the wireless receiver in accordance with the invention;

FIG. 6 comprises a schematic diagram of a power supply in accordance with the invention;

FIG. 7 comprises a schematic diagram of a controlling circuit and various controlled elements in accordance with the invention; and

FIG. 8 comprises a schematic diagram of a watch dog circuit in accordance with the invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawings, and in particular to FIG. 1, an articulated bed can be seen generally as depicted by reference numeral **100**. The articulated bed **100** includes generally a body supporting surface **101** and a frame **102** to support the body supporting surface. In a well understood manner, the body supporting surface **101** comprises a mattress with an articulated skeletal structure that allows the mattress to be manipulated into various positions, thereby allowing an individual using the bed to raise his or her head, or legs and feet, as desired to obtain various therapeutic affects or degrees of comfort.

To effect movement of the body supporting surface **101**, two lifting motors **103** and **104** are provided in the frame **102**. These motors **103** and **104** drive appropriate mechanical coupling devices (not shown) to cause portions of the body supporting surface **101** to move as noted above. The body supporting surface **101** also has disposed therewithin two vibrating motors **106** and **107**; one such motor **106** has been positioned to impart vibration to that portion of the body supporting surface **101** that supports the head and/or upper body of a user, and the other motor **107** has been positioned to impart vibration to that portion of the body supporting surface **101** that supports the feet and/or lower leg extremities. (Other locations for the vibrating motors could of course be chosen to meet other intended applications.)

These various motors are all powered by an external power supply **108** that couples to a standard AC power source **113**, and are all controlled by a control unit **109**. The control unit **109**, in turn, responds to a remote control unit **111**. The remote control unit **111**, in this embodiment, comprises a wireless transmitter that transmits amplitude modulated keyed control signals **112** to the control unit **109**. The control unit **109** receives these keyed control signals **112**, decodes them, and controls the various motors in accordance therewith.

All of the above controlled and controlling elements will be described in more detail below where appropriate. In addition, for supplemental information regarding such articulated beds, the reader is referred to U.S. patent application Ser. No. 07/518,134, filed on May 3, 1990 (abandoned) by Sechrist et al. for an Articulated Bed Arrangement, the contents of which are incorporated herein by this reference.

In FIG. 2, the remote control unit **111** can be seen to be generally comprised of a keyboard **201**, an encoder **202**, a key **203**, a transmitter **204**, and a radiating element **205**.

The keyboard **201** comprises an appropriate input device for allowing a user of the bed (or other individual responsible for the individual using the bed) to enter desired instructions regarding operation of the bed. For example, with respect to the lifting motors **103** and **104**, a user can enter instructions regarding raising and lowering selecting portions of the body supporting surface **101**. With respect to the vibratory motors **106** and **107**, a user can enter instructions regarding activation and deactivation of either or both motors and a corresponding amount of vibration.

The keyboard **201** accepts these control instructions and provides representative control signals to the encoder **202**. The encoder **202** prepares these signals for transmission, and in particular, processes the signals as a function of a key **203**. For example, the processing can include encrypting the control signals as a function of the key in conjunction with an encryption algorithm. Or, by way of another example, the key **203** can simply comprise an identifier that is bundled with the control signal prior to transmission.

The keyed control signals are then provided to the transmitter **204**, where they are amplitude modulated onto a selected one of three possible carrier frequencies (380, 410, and 435 Mhz). The resultant modulated carrier signal **206** then radiates from the radiating element **205**, in accordance with well understood prior art technique. (Other appropriate carrier frequencies could of course be used, and other modulation schemes could be selected as well.)

With reference to FIG. 3, certain aspects of the remote control device **111** will now be described in more detail.

The keyboard **201**, in this embodiment, comprises twelve push button switches P1 through P12. When actuated by a user, these switches produce a temporary closed circuit. Via the circuit matrix depicted (comprised of a plurality of diodes, resistors, and capacitors), the encoder **202** identifies the particular switch actuated, and processes that information as a function of the key **203** to provide a nine bit keyed control signal at its output to the transmitter **204**. Using the switch matrix depicted to provide the key **203**, this embodiment will accommodate **243** different keys, thereby greatly minimizing the likelihood of interference between nearby beds.

Additional description regarding the encoder **202** and the transmitter **204** can be found in the previously mentioned Ser. No. 07/518,134 (abandoned) and hence will not be repeated here.

Referring now to FIG. 4, the various elements disposed within the body supporting surface **101** and/or frame **102** are generally depicted. The control unit **109** can be seen to include generally a signal receiver **401**, a controller **406**, a lifting motor interface **408**, and a vi-

brating motor interface 410. Also provided are a watch dog circuit 407 and an overload sensor 409.

The signal receiver 401 includes generally an antenna 402, a receiver 403, a decoder 404, and a key 405. The receiver 403 converts the amplitude modulated carrier signal transmitted by the remote control unit 111 into a recovered keyed control signal in accordance with well understood prior art technique. The recovered keyed control signal is then processed in the decoder 404 as a function of the key 405 (which is, of course, the same key 203 as that used in the remote control device 111 to provide a recovered control signal that corresponds to the original instruction initiated by the user upon actuating the remote control device keyboard 201.

The controller 406 receives the control signal and determines a proper response. If the instruction relates to the lifting motors 103 and 104, the controller 406 issues an appropriate signal 411 to the lifting motor interface 408, which in turn provides an appropriate signal to whichever of the motors 103 or 104 the control is intended for. For example, if the user instructed the system to lower the head portion of the body supporting surface, the control signal would correspond to that instruction, and the controller would issue a resultant signal 411 that would cause the associated motor 103 to activate in a particular direction of rotation to cause the head portion to lower.

This embodiment also provides an overload sensor 409 that senses whether the lifting motors 103 and 104 are operating in an overloaded mode. When an overload is sensed, the overload sensor 409 provides this information to the controller 406, and the controller 406 deactivates the affected motor, regardless of whether contrary instructions are then being acted upon or received, thereby protecting the motor (and possible the bed and/or user) from damage or injury.

If the instructions relate instead to the vibratory motors 106 or 107, the controller 406 issues an appropriate controlling signal 412 to the vibrating motor interface 410, which in turn controls the appropriate vibrating motor 106 or 107 to effect the desired action. In this embodiment, the vibratory motors 106 and 107 can be individually activated or deactivated. In addition, each motor can be driven to produce any of five discrete levels of vibration. To accomplish this, the controller 406 provides a pulse width modulated control signal 412, wherein the width of the pulse determines the vibration level.

Also in this embodiment, the controller 406 includes an internal timer. This timer monitors the duration of activation for each vibrating motor 106 and 107. When a particular period of activation exceeds a selected threshold, the controller 406 deactivates that particular motor, notwithstanding the possible current reception of contrary signals. In this embodiment, the threshold is about twenty minutes, and this protects the user from undue exposure to vibration.

Referring now to FIG. 5, the signal receiver 401 will be described in more detail.

The receiver 403 itself comprises a superregenerative receiver and is essentially set forth and described in the Ser. No. 07/518,134 referred to above. Therefore, no additional detail need be set forth here.

The decoder 404 includes an MC145027 decoder 501 as manufactured and sold by Motorola, Inc. The recovered keyed control signal from the receiver 403 is provided to pin 9 of the MC145027. The MC145027 processes the keyed control signal as a function of the key 405 provided by the switches that are coupled to pins 1 through 5 of the MC145027, and provides the resultant recovered control signal at its output (pins 11 through 15).

Referring now to FIG. 6, the external power supply 108 will be described in more detail.

The external power supply 108 couples 113 to an appropriate source of standard AC power (such as 50 or 60 Hz at 110, 120, or 240 volts). As configured, the power supply 108 provides 5 volts DC, 8 volts DC, 12 volts DC, and 24 volts DC. These voltages are provided to the various circuit elements, described above and below, as appropriate. The previously mentioned Ser. No. 07/518,134 provides a description of that part of the power supply 108 that provides the 5 volt and 24 volt DC, and hence that portion of the power supply 108 need not be redescribed here. To provide the 8 volt DC, a 7808 voltage regulator 601 couples to the 12 volt output of the first rectifier bridge 602. The output of the regulator 601 is filtered by a capacitor 603, and this 8 volt DC source is used primarily to drive the receiver 403 of the code receiver 401. The 12 volt DC source is taken directly from the output of the first rectifier 602, and is used in conjuction with the lifting motor interface 408, as described below in more detail.

Importantly, the power supply 108 is located external to the body supporting surface 101 and the frame 102. Only the relatively low voltage DC signals are delivered into the body supporting surface 101 and frame 102 to provide the necessary operating power to the various controlling and controlled elements.

Referring now to FIG. 7, the controller 406 is provided through use of an MC68705P3 central processing unit (CPU) as manufactured and sold by Motorola, Inc. The five output lines from the signal receiver 401 are provided to five input ports of the CPU 406 (pins 8 through 11 and 22). Four of the CPU's output ports (pins 12 through 15) couple to the lifting motor interface 408, and two of the output ports (pins 18 and 19) couple to the vibrating motor interface 410.

The lifting motor interface 408 has four separate relays 701 through 704, configured such that each of the CPU's output pins dedicated to this interface 408 will control one of the relays. In particular, each output pin couples through a voltage divider comprised of two resistors 705 and 706 to the base of a switch transistor 707. When the transistor 707 for a particular relay is switched on by the CPU 406, a circuit is completed between the 12 volt DC source and ground through the windings of that relay, thereby energizing that relay and causing an associated switch to close. The switches associated with the four relays are shown as being coupled to each terminal of the two lifting motors 103 and 104, respectively, with the switches being denoted by the reference numerals 710 through 713. With the switches configured as depicted, either motor 103 and 104 can be activated with respect to a particular direction of rotation, or deactivated.

The overload sensor 409 comprises a resistor network 715 that couples to sense current draw through the motors 103 and 104. When the current draw exceeds a threshold determined by the resistor network 715, thereby indicating that an overload condition exists, a transistor 716 is biased on and pin 21 of the CPU 406 is set low through an optocoupler 717 (this and other optocouplers described below can be provided through use of a 4N35). When pin 21 of the CPU 406 goes low, output pins 12 through 15 are immediately taken low as

well, thereby causing all of the relays 701 through 704 to be deenergized. This, of course, removes power from all of the lifting motors 103 and 104, thereby preserving the motors from possible harm due to the overload condition.

As noted above, CPU output pins 18 and 19 couple to the vibrating motor interface 410. In each case, the output pin connects to a corresponding optocoupler 720 or 721. When switched on, these optocouplers 720 and 721 in turn switch on an associated drive transistor 722 and 723. The latter, when switched on, complete a circuit between the 24 volt DC source and ground through a corresponding vibration motor 106 or 107. The control signal from the CPU constitutes a pulse width modulated signal, and in this embodiment, the signal can have any of five preselected widths. The drive transistor 722 and 723 will remain switched on for the duration of the control pulse width, such that the longer the pulse width, the longer the corresponding vibration motor will remain on, thereby significantly influencing the amount of vibration imparted to the body supporting surface 101 in the vicinity of the vibrating motor.

Referring now to FIG. 8, the watch dog circuit will be described in more detail.

The watch dog circuit 407 is constructed about a CD4093 having four 2 input NAND gates 801 through 804. Pin 20 of the CPU 406 couples through a signal conditioning network 805 to an input of the first NAND gate 801 (the signal conditioning network essentially comprises a timing network that will eventually respond to the lack of a signal from pin 20 of the CPU 406). When pin 20 remains low for too long a period of time (thereby indicating a problem), the first NAND gate 801 goes high, causing the second NAND gate 802 to go low, the third NAND gate 803 to go high, and the fourth NAND gate 804 to go low. The output of the fourth NAND gate 804 couples to the reset port of the CPU (pin 28). When the reset port goes low, the CPU is reset. The low condition at the reset port will continue for a period of time determined by the timing network 806 associated with the second NAND gate 802.

By provision of the above described articulated bed, a fixed position control panel can be avoided without simultaneously increasing the risk that operation of one bed will interfere with the operation of other nearby beds. Further, a wide variety of control features can all be remotely controlled, including body supporting surface manipulation and vibration. Also, risk of life threatening electric shock is significantly reduced.

Those skilled in the art will appreciate that various modifications could be made to the above described embodiments without departing from the inventive concepts set forth.

I claim:

1. An articulated article of furniture comprising:

A) a body supporting surface having at least first and second portions thereof being movable with respect to one another;

B) a motor operably coupled to at least one of the first and second portions;

C) control means operably coupled to the motor for controlling the motor, and hence, controlling positioning of the first portion with respect to the second portion, in response to reception of motor control signals;

D) wireless receiver means operably coupled to the control means, for receiving encryted motor control signals and for providing the encrypted motor control signals to the control means.

2. The articulated article of furniture of claim 1, and further including frame means for supporting the body supporting surface.

3. The articulated article of furniture of claim 2, wherein the motor, control means, and wireless receiver means are all disposed within the frame means.

4. The articulated article of furniture of claim 3, wherein the motor, control means, and wireless receiver means are each powered by no more than 24 volts DC.

5. The articulated article of furniture of claim 4, and further including power supply means disposed exterior to the frame means for providing the no more than 24 volts DC, wherein the power supply means includes:

i) first means for coupling to an AC power source to receive an AC power signal; and

ii) second means operably coupled to the first means for converting the AC power signal into the no more than 24 volts DC.

6. The articulated article of furniture of claim 1, and further comprising:

E) wireless transmitter means for:

i) sourcing motor control signals;

ii) processing the motor control signals as a function of a preselected key to provide the encryted motor control signals; and

iii) transmitting the encryted motor control signals to the wireless receiver means.

7. The articulated article of furniture of claim 6, wherein the wireless receiver means further includes means for processing the encryted motor control signals as a function of the preselected key to recover the encryted motor control signals.

8. The articulated article of furniture of claim 1, and further comprising:

E) vibration means for imparting vibration to at least some part of the body supporting surface; wherein the control means is further coupled to the vibration means for controlling the vibration means, and hence, controlling impartation of vibration to at least some part of the body supporting surface, in response to reception of vibration control signals.

9. The articulated article of furniture of claim 8, wherein the wireless receiver means further functions to receive encryted vibration control signals and to provide the encryted vibration control signals to the control means.

10. The articulated article of furniture of claim 9, and further including frame means for supporting the body supporting surface.

11. The articulated article of furniture of claim 10, wherein the motor, vibration means, control means, and wireless receiver means are each disposed within the frame means.

12. The articulated article of furniture of claim 11, wherein the motor, vibration means, control means, and wireless receiver means are all powered by no more than 24 volts DC.

13. The articulated article of furniture of claim 12, and further including power supply means disposed exterior to the frame means for providing the no more than 24 volts DC, wherein the power supply means includes:

i) first means for coupling to an AC power source to receive an AC power signal; and

ii) second means operably coupled to the first means for converting the AC power signal into the no more than 24 volts DC.

14. The articulated article of furniture of claim 9, and further comprising:

F) wireless transmitter means for:

i) sourcing motor control signals and vibration control signals;

ii) processing the motor control signals and vibration control signals as a function of a preselected key to provide the encrypted motor control signals and encrypted vibration control signals; and

iii) transmitting the encrypted motor control signals and encrypted vibration control signals to the wireless receiver means.

15. The articulated article of furniture of claim 14, wherein the wireless receiver means further includes means for processing the encrypted motor control signals and encrypted vibration control signals as a function of the preselected key to recover the encrypted motor control signals and the encrypted vibration control signals.

16. The articulated article of furniture of claim 15, wherein the motor control signals includes signals to control:

i) activation of the motor;

ii) deactivation of the motor;

iii) direction of rotation of the motor.

17. The articulated article of furniture of claim 16, wherein the motor control means includes means for sensing an overload condition with respect to operation of the motor, and for deactivating operation of the motor in response thereto, regardless of whether an encrypted motor control signal contrary to deactivation is then currently being received by the wireless receiver means.

18. The articulated article of furniture of claim 15, wherein the encrypted vibration control signals includes signals to control:

i) activation of the vibration means;

ii) deactivation of the vibration means;

iii) levels of vibration imparted to the body supporting surface.

19. The articulated article of furniture of claim 18, wherein the encrypted vibration control signals related to the levels of vibration imparted to the body supporting surface include a plurality of discrete vibration levels.

20. The articulated article of furniture of claim 19, wherein the plurality of discrete vibration levels comprise five separate levels of vibration.

21. The articulated article of furniture of claim 18, wherein the control means includes clock means for causing deactivation of the vibration means following a predetermined period of duration of activation, regardless of whether an encrypted vibration control signal contrary to deactivation is then currently being received by the wireless receiver means.

22. The articulated article of furniture of claim 21, wherein the predetermined period of duration of activation is approximately twenty minutes.

23. The articulated article of furniture of claim 1 wherein at least one of the motor, control means, and wireless receiver means is powered by no more than 24 volts DC.

24. The articulated article of furniture of claim 1 wherein the motor is powered by no more than 24 volts DC.

25. The articulated article of furniture of claim 1 wherein the control means is powered by no more than 24 volts DC.

26. The articulated article of furniture of claim 1 wherein the wireless receiver means is powered by no more than 24 volts DC.

27. The articulated article of furniture of claim 1 wherein the motor and the control means are each powered by no more than 24 volts DC.

28. The articulated article of furniture of claim 1, wherein the motor and the wireless receiver means are each powered by no more than 24 volts DC.

29. The articulated article of furniture of claim 1 wherein the control means and the wireless receiver means are each powered by no more than 24 volts DC.

30. The articulated article of furniture of claim 1 wherein the motor, control means, and wireless receiver means are each powered by no more than 24 volts DC.

31. An articulated article of furniture, comprising:

A) a body supporting surface having at least first, second, and third portions thereof and being movable with respect to one another;

B) a first motor operably coupled to the first portion;

C) a second motor operably coupled to the third portion;

D) first vibration means for imparting vibration to at least some part of the body supporting surface;

E) control means operably coupled to the first and second motor and the first vibration means, for controlling the first and second motor and the first vibration means, thereby controlling positioning of the first, second, and third portions with respect to one another, and the impartation of vibration to the body supporting surface, in response to reception of first encrypted motor control signals, second encrypted motor control signals, and first encrypted vibration control signals;

F) wireless receiver means operably coupled to the control means, for receiving encrypted motor control signals and encrypted vibration control signals, and for providing the first encrypted motor control signals, the second encrypted motor control signals, and the first encrypted vibration control signals to the control means.

32. The articulated article of furniture of claim 31, wherein the control means operably couples to the first and second motor through a plurality of relays, and operably couples to the first vibration means through at least one optocoupler.

33. The articulated article of furniture of claim 32, wherein the control means provides pulse width modulated signals to the at least one optocoupler.

34. An article of furniture comprising:

A) a body supporting surface having at least first and second portions thereof and being movable with respect to one another;

B) a motor operably coupled to at least one of the first and second portions;

C) vibration means for imparting vibration to at least some part of the body supporting surface;

D) control means operably coupled:

i) to the motor through at least one relay for controlling the motor, and hence, controlling positioning of the first portion with respect to the

second portion, in response to reception of motor control signals; and

ii) to the vibration means through at least one optocoupler for controlling the vibration means, and hence, controlling impartation of vibration to at least some part of the body supporting surface, in response to reception of vibration control signals;

E) wireless receiver means operably coupled to the control means for receiving:

i) keyed motor control signals and for providing the motor control signals to the control means; and

ii) keyed vibration control signals and for providing the vibration control signals to the control means.

35. The articulated article of furniture of claim 34, wherein the control means controls the vibration means through provision of pulse width modulated drive signals.

* * * * *

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1922-1989

February 16, 2007

John F. Shoro, Esquire *(Via facsimile 508-929-3048)*
Bowditch & Dewey
311 Main Street
Worcester, MA 01615

Re: Librandi

Dear John:

I received the objections of Attorney Mirick and would simply ask you in your consideration of those comments to recognize that if one is going to use the company's debt in it's analysis it is improper to simply apply the debt to the cash value approach. The more proper way of establishing value if the liabilities are to be considered would be to arrive at an adjusted book value by first determining the fair market value of the assets of the company. After determining what weight to apply to the adjusted book value method versus the revenue capitalization method, a blended valuation would be determined.

Other than that comment as stated, I accept the terms of your Master's Report.

Very truly yours,

Francis J. Russell

FJR/bab

cc: John O. Mirick, Esquire *(Via facsimile 508-791-8502)*
Russell P. Schwartz, Esquire *(Via facsimile 508-752-9844)*