

- [54] **ADJUSTABLE HOSPITAL BED
INSTANTLY MOVABLE TO A
TRENDLENBURG POSITION**
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- [51] Int. Cl.A61g 7/00
- [58] Field of Search5/62-64, 66-69, 5/86

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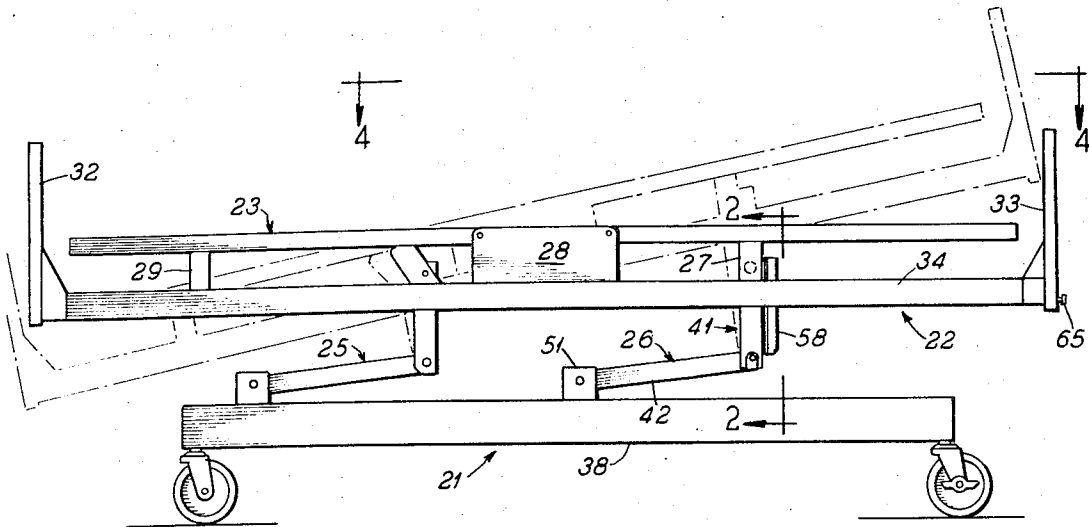
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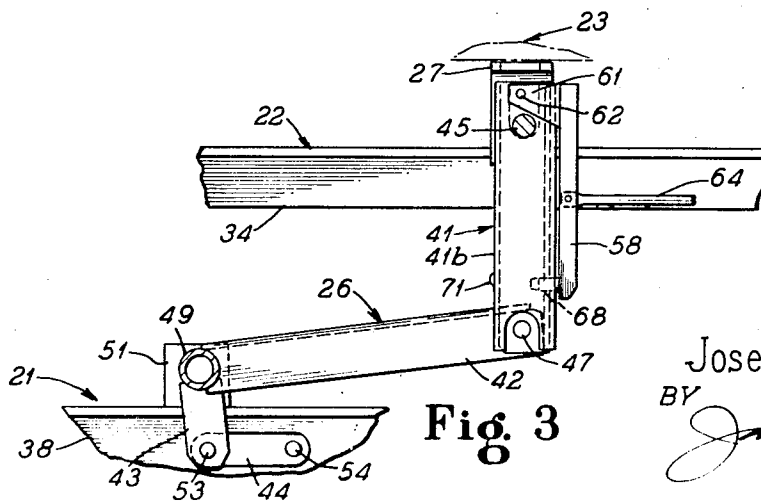
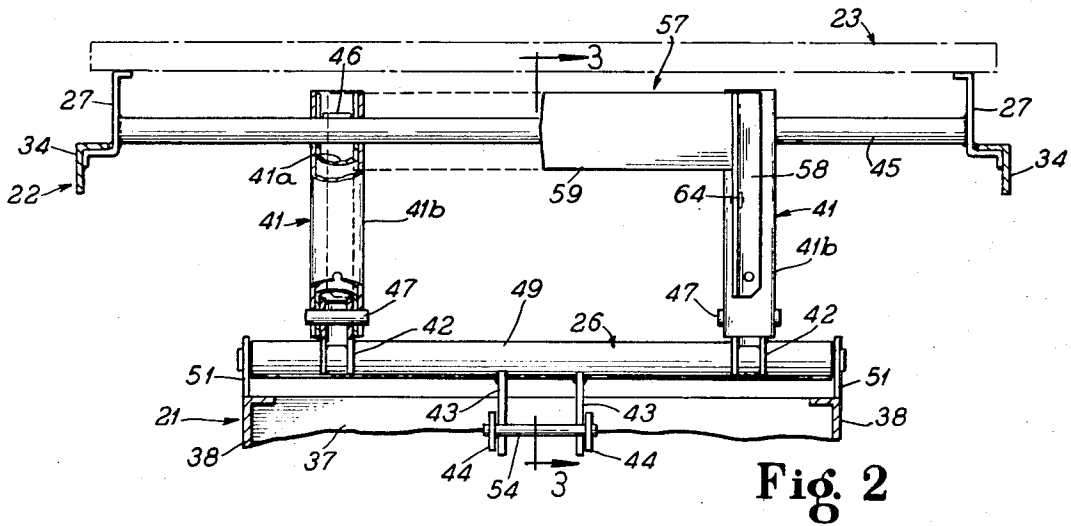
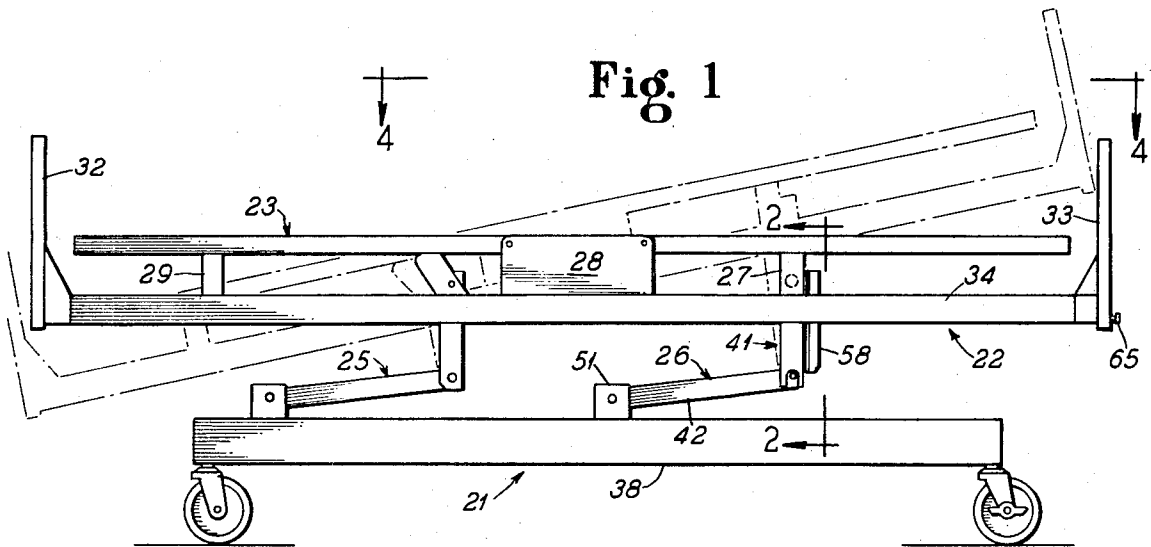
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[57] **ABSTRACT**

The hospital bed has articulated head and foot elevation linkage systems that effect vertical movement of an upper horizontal frame, to which a mattress supporting structure is attached, with respect to a fixed lower horizontal frame. Rapid shifting to a trendelenburg position is achieved by providing, in the foot linkage system, an extendible segment having a pair of elongated links one of which is slidably and rectilinearly movable in the other. The segment may be quickly extended and locked, and by so doing the upper frame becomes tilted at a desired trendelenburg angle with its foot end raised relative to its head end.

3 Claims, 7 Drawing Figures





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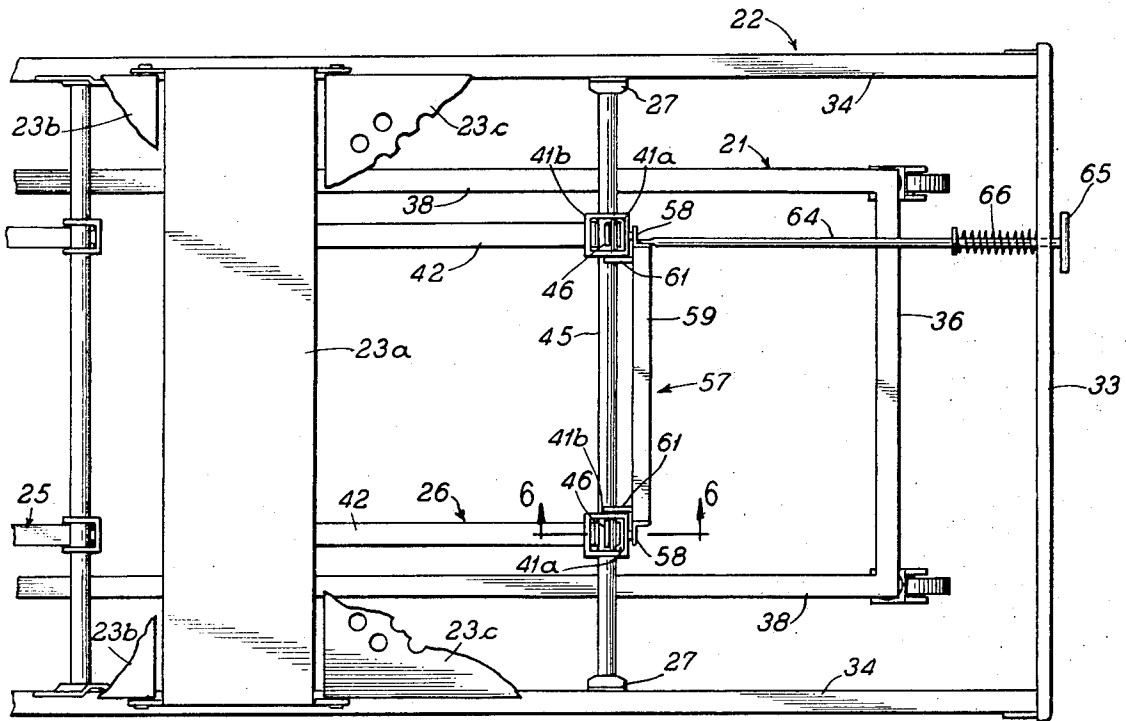


Fig. 4

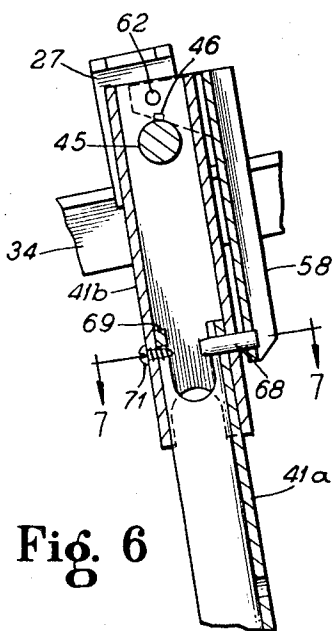


Fig. 6

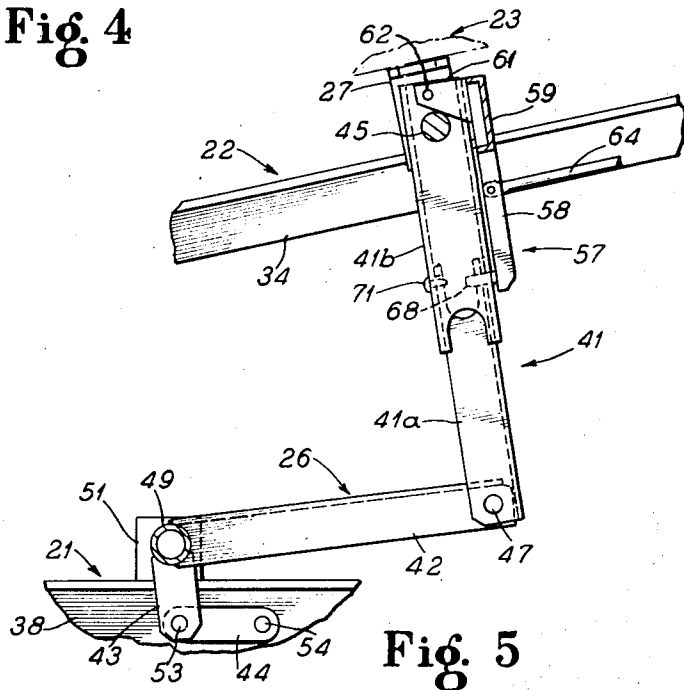


Fig. 5

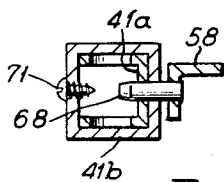


Fig. 7

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ADJUSTABLE HOSPITAL BED INSTANTLY MOVABLE TO A TRENDLENBURG POSITION

BACKGROUND OF THE INVENTION

This invention relates to a novel hospital bed construction in which a mattress supporting structure is vertically adjustable but may be instantly tilted or canted to a trendelenburg position irrespective of its particular vertical level at the time.

Previously developed hospital beds, capable of assuming a trendelenburg or shock position, generally employ for vertical adjustment relatively complex elevation linkage systems that are manually or motor operated. Unfortunately, substantial time is required to manipulate such hospital beds to a trendelenburg position, which causes the body of the patient occupying the bed to be tilted between 10° and 20° from the horizontal with the head lying below the knees and legs. The slowness of the prior beds is a definite disadvantage since time is usually of the essence when a patient goes into shock; it is imperative that no time is lost in placing the patient's body in a trendelenburg position. This shortcoming has now been overcome. The hospital bed of the present invention may be rapidly shifted to such a position and yet this is realized by a relatively simple, uncomplicated and inexpensive mechanical arrangement.

It is, therefore, an object of the invention to provide a new and approved adjustable hospital bed capable of assuming at least one trendelenburg position.

Another object is to provide a unique hospital bed that is shiftable to a trendelenburg position in less time than heretofore possible.

SUMMARY OF THE INVENTION

The invention is to be incorporated in an adjustable hospital bed of the type having articulated head and foot elevation linkage systems for vertically moving an upper horizontal frame with respect to a fixed lower horizontal frame while at the same time maintaining the frames substantially parallel to each other. An extendible segment is included in the foot linkage system for effecting a greater separation between the frames at their foot ends than at their head ends and this segment includes a pair of elongated links one of which is slidably and rectilinearly movable in the other. There are control means for establishing the segment selectively in non-extended and extended conditions. The upper frame remains horizontal regardless of its vertical position when the segment is in its non-extended condition, whereas when in its extended condition the upper frame is tilted to a trendelenburg position with its foot end raised relative to its head end.

DESCRIPTION OF THE DRAWINGS

The features of the invention which are believed to be novel are set forth with particularity in the appended claims. The invention, together with further objects and advantages thereof, may best be understood, however, by reference to the following description in conjunction with the accompanying drawings in which like reference numbers identify like elements, and in which:

FIG. 1 is a side view of a hospital bed having articulated head and foot elevation linkage systems and constructed in accordance with the invention, full lines il-

lustrating the bed in a normal horizontal position and broken lines showing it when shifted to a trendelenburg position;

FIG. 2 is a fragmentary sectional view of the bed taken along section line 2—2 in FIG. 1, and provides an end view of the foot linkage system;

FIG. 3 is a fragmentary sectional view of the bed taken along section line 3—3 in FIG. 2, and illustrates most clearly the details of the foot linkage system and the relative positions of the elements of an extendible segment in that linkage system when the bed is in a normal horizontal position;

FIG. 4 is a fragmentary top or plan view, with parts of a mattress supporting structure broken away, of that portion of the bed bracketed by section line 4—4 in FIG. 1;

FIG. 5 is a fragmentary sectional view corresponding to that of FIG. 3 except that it illustrates the condition of the foot linkage system when the bed is shifted to its trendelenburg position, and in that condition the extendible segment of the linkage system is fully extended and locked;

FIG. 6 is a fragmentary sectional view taken along section line 6—6 in FIG. 4 and shows in detail the manner in which the extendible segment is locked in its extended condition; and,

FIG. 7 is a sectional view taken along section line 7—7 in FIG. 6.

DESCRIPTION OF THE ILLUSTRATED EMBODIMENT

The disclosed hospital bed includes a stationary or fixed lower horizontal frame 21, a movable upper horizontal frame 22 and a mattress supporting structure or frame 23. Movable frame 22 is supported on and is vertically adjustable with respect to fixed frame 21 by means of articulated head and foot elevation linkage systems 25, 26, respectively. Mattress frame 23 is secured to frame 22 by support brackets 27, 28 and 29. For convenience of illustration and to avoid encumbering the drawings, frame 23 is shown in FIG. 1 as a flat, continuous structure stretching the entire length of movable frame 22. Preferably frame 23 would be articulated, being divided into four different segments or panels, namely a back panel, a center panel, an upper knee panel and a lower knee panel. Back and knee linkage assemblies (not shown) would be employed to angularly position the panels to the contour desired by or required for the patient. In FIG. 4 the entirety of the center panel, designated by the reference numeral 23a, is shown. Portions of the back and upper knee panels, identified by the numerals 23b and 23c respectively, are also illustrated in FIG. 4. The construction of the back and knee linkage assemblies may take the form of that shown in U.S. Pat. No. 3,222,693, issued Dec. 14, 1965 to Fred Pruim et al. and assigned to the present assignee.

Movable frame 22 includes a head board 32, a foot board 33, and a pair of side L-shaped channels 34. Fixed frame 21 consists of four L-shaped channels a foot-end channel 36, a head-end channel 37 (see FIG. 2), and a pair of side channels 38.

Articulated foot elevation linkage system 26, which may be controlled to raise or lower the foot end of movable frame 22 relative to fixed frame 21, generally

comprises four interconnected or joined segments 41, 42, 43 and 44. Segments 41 and 42 are pivotally interconnected, segments 42 and 43 are rigidly joined, and segments 43 and 44 are pivotally intercoupled. More particularly segment 41, in accordance with a salient feature of the invention, is extendible and comprises two pairs of elongated links 41a, 41b, one link (link 41a) of each pair being slidably and rectilinearly movable in the other link 41b of the pair. Each link 41a is specifically channel shaped with one open side and it telescopes into the associated link 41b which takes the form of a four-sided tube. Apertures are provided in links 41b at their top ends so that they may be pivotally coupled to a cross tube 45 which in turn is rigidly secured to support brackets 27. Even with such pivotal intercoupling, however, the longitudinal axes of links 41b, and consequently links 41a, will remain generally vertical and substantially perpendicular to upper frame 22 at all times. Small bars 46 are rigidly attached to cross tube 45 to serve as locators, namely to maintain links 41b in their desired positions along tube 45.

The bottom or lower ends of links 41a are pivotally connected by means of pins 47 to ends of respective ones of a pair of channel shaped long lever arms which together constitute segment 42. The opposite ends of arms 42 are rigidly affixed to a pivot tube 49 which in turn is rotatably mounted to a pair of brackets 51 rigidly secured to side channels 38 of fixed frame 21. Segment 43 of linkage system 26 comprises a pair of short lever arms rigidly secured to pivot tube 49 and extending substantially at a right angle from long lever arms 42. Segment 44 takes the form of a pair of links each of which is pivotally connected to a respective one of lever arms 43 by a pin 53. As shown in FIG. 2, a pin 54 is mounted to and extends between links 44. Linkage system 26 may be actuated to vertically position the foot end of frame 22, and consequently the foot end of mattress support 23, by a motor operated mechanism (not shown) that moves pin 54 along a straight path perpendicular to the view shown in FIG. 2 and parallel to the plane defined by the top edge of fixed frame 21. Such a mechanism for positioning pin 54 is illustrated and described in the aforementioned Pruim et al. U.S. Pat. No. 3,222,693.

Head elevation linkage system 25 may take any well known construction; one such construction is fully disclosed in the aforementioned Pruim et al. patent. The same mechanism for actuating linkage system 26 to adjust the elevation of the foot end of frame 22 may be used to control linkage system 25 to manipulate the head end of frame 22.

Since frame 22 is normally horizontal, extendible segment 41 of linkage system 26 is normally in its non-extended condition as shown in FIGS. 1, 2 and 3. It is held in that condition by a spring-biased latching or locking assembly 57 which comprises a pair of generally vertical channel-shaped latch arms 58 separated by and rigidly affixed to a spacer channel 59. A pair of hinge plates 61, rigidly secured to spacer channel 59, are pivotally connected to respective ones of links 41b by a pair of pivot pins 62. One end of a release link 64 is pivotally connected to one of latch arms 58 and the other end of link 64 extends through an aperture in foot board 33, terminating in a handle 65. A coil compression spring 66 urges latch arms 58

toward segment 41. When that segment is in its non-extended condition a pair of locking pins 68, rigidly connected to respective ones of arms 58, extend through pairs of mating apertures in links 41a and 41b to lock those links against relative movement.

When segment 41 is in its non-extended condition, the illustrated hospital bed may be adjusted essentially in the manner described in the aforementioned Pruim et al. patent. Briefly when it is desired to raise upper frame 22 and mattress support 23, pin 54 is moved to the right as viewed in FIG. 3, as a result of which lever arms 42 pivot in a counter clockwise direction about tube 49. This in turn raises segment 41 and consequently cross tube 45, whereupon the foot ends of frames 22 and 23 rise. At the same time, linkage system 25 is pivoted in similar fashion to effect the same amount of vertical repositioning of the head ends of frames 22 and 23. The actions of the two linkage systems 25, 26 are correlated so that upper frame 22 remains horizontal, and thus parallel to frame 21, at all vertical positions. Of course, lowering of frames 22 and 23 is effected by moving pin 54 to the left to cause linkage system 26 to pivot clockwise around tube 49, linkage system 25 undergoing the same amount of clockwise rotation.

Assume now that the patient reclined on the illustrated bed suddenly goes into shock. With the present invention, the bed may be instantly shifted into the trendelenburg position as shown by dashed construction lines in FIG. 1. The doctor, nurse or attendant present merely grasps handle 65 and pulls it outwardly away from foot board 33 and at the same time exerts an upward force on the foot board. Initially, latching assembly 57 pivots around pins 62 to withdraw locking pins 68 from the apertures of links 41a and 41b. Links 41a then telescope out of links 41b and the foot ends of frames 22 and 23 rise until segment 41 is established in its extended condition, shown in FIGS. 5 and 6. Apertures in links 41a at their top ends receive pins 68 in order to lock the segment in its extended condition. The bed may be appropriately counter balanced so that relatively little upward force is required to elevate the foot end of the bed to the trendelenburg position. A pair of stop blocks (see block 69 in FIG. 6), each of which is rigidly affixed to and across the open side of a respective one of channel shaped links 41a, cooperate with a pair of stop screws screwed into respective ones of links 41b (one such screw labeled by the reference numeral 71 is shown in FIGS. 3 and 5-7) to captivate the two pairs of links 41a, 41b at their limit of travel. This prevents links 41b from being completely lifted off and separated from links 41a when the operator manually raises foot board 33. Return of the bed to its normal horizontal position is achieved by pulling handle 65 (to unlock segment 41) and lowering the foot board.

If desired, handle 65 may be located immediately behind foot board 33 (namely to the left of board 33 as viewed in FIGS. 1 and 4) to ease the task of simultaneously pulling the handle and lifting the foot board when it is necessary to shift the bed to the trendelenburg position. It also facilitates a better grip on the foot board when the bed is moved from its trendelenburg position to its normal position.

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The invention provides, therefore, a unique vertically adjustable hospital bed which may be quickly manipulated to a trendelenburg position from any vertical level, and this is accomplished by a relatively simple, reliable and inexpensive mechanism.

While a particular embodiment of the invention has been shown and described, modifications may be made, and it is intended in the appended claims to cover all such modifications as may fall within the true spirit and scope of the invention.

I claim:

1. An adjustable hospital bed having articulated head and foot elevation linkage systems for vertically moving an upper horizontal frame with respect to a fixed lower horizontal frame while at the same time maintaining the frames substantially parallel to each other, comprising:

an extendible segment in said foot linkage system for effecting a greater separation between the frames at their foot ends than at their head ends and including a pair of straight elongated links, one of which is slidably and rectilinearly movable in the other, positioned such that their longitudinal axes are generally vertical and substantially perpendicular to the upper frame at all times,

the top end of said other link being pivotally con-

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nected to the upper frame while the bottom end of said one link is pivotally connected to another segment of the articulated foot linkage system;

and control means for establishing said extendible segment selectively in non-extended and extended conditions, the upper frame remaining horizontal regardless of its vertical position when said extendible segment is in its non-extended condition, whereas when said extendible segment is in its extended condition the upper frame is tilted to a trendelenburg position with its foot end raised relative to its head end.

2. An adjustable hospital bed according to claim 1 in which said control means includes latching means spring-biased to lock said one link to said other link in each of the two conditions of said extendible segment, and in which a manually operated release member facilitates unlocking of said latching means to permit manual shifting of the upper frame between its horizontal and trendelenburg positions.

3. An adjustable hospital bed according to claim 2 in which said latching means includes a pin that projects, when said extendible segment is in its extended position, through mating apertures in said links to lock said links against relative movement.

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