June 6, 1967 R. H. WILLER ETAL 3,323,145

HOSPITAL BED

Filed Oct. 22, 1965 2 Sheets-Sheet 1

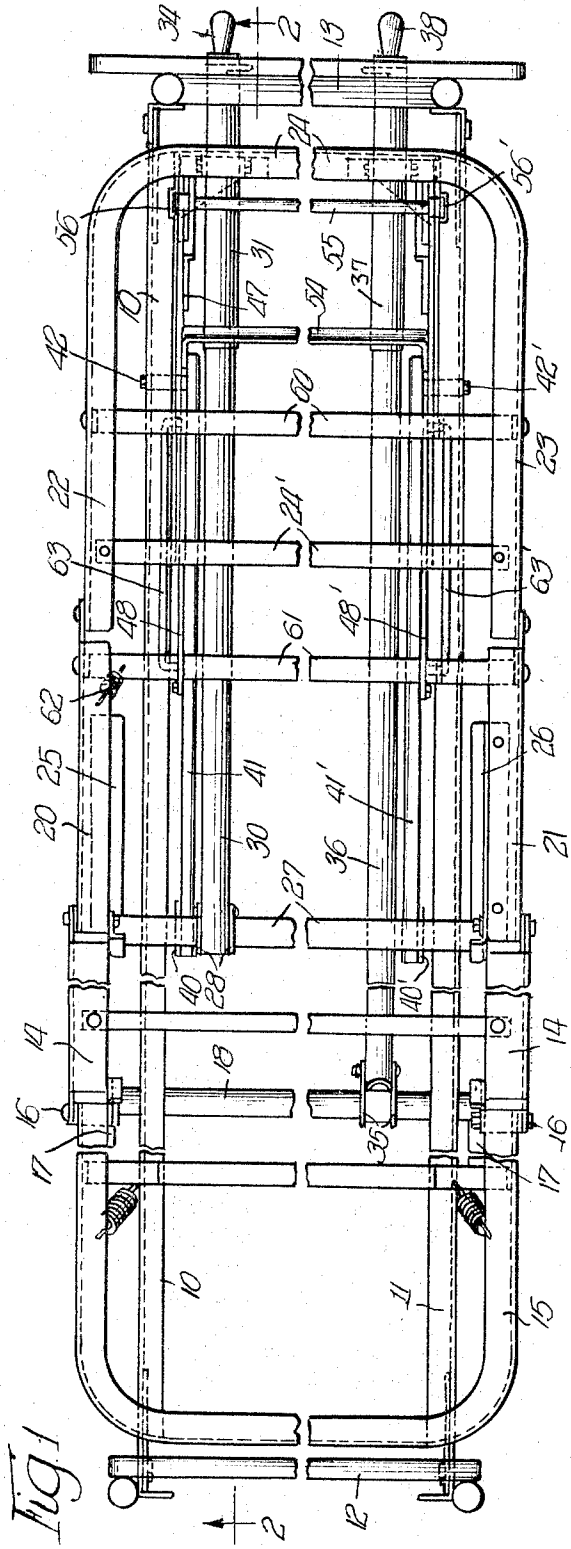


Fig. 1

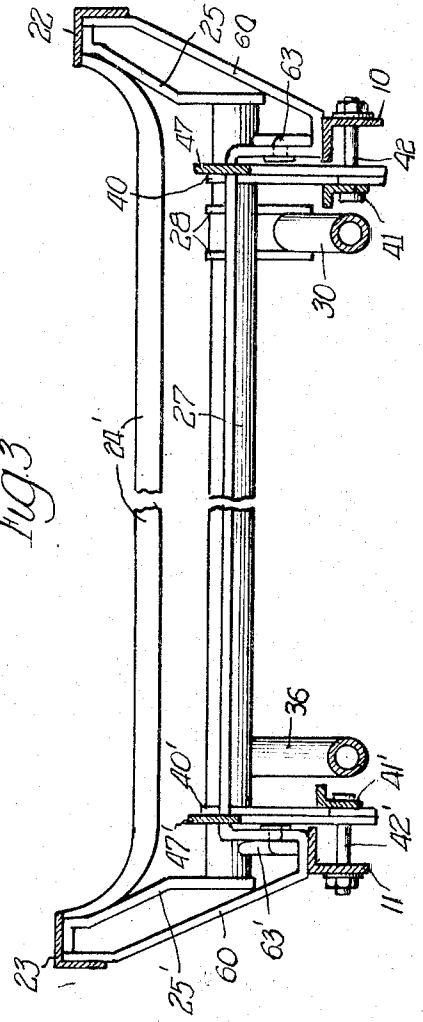


Fig. 3

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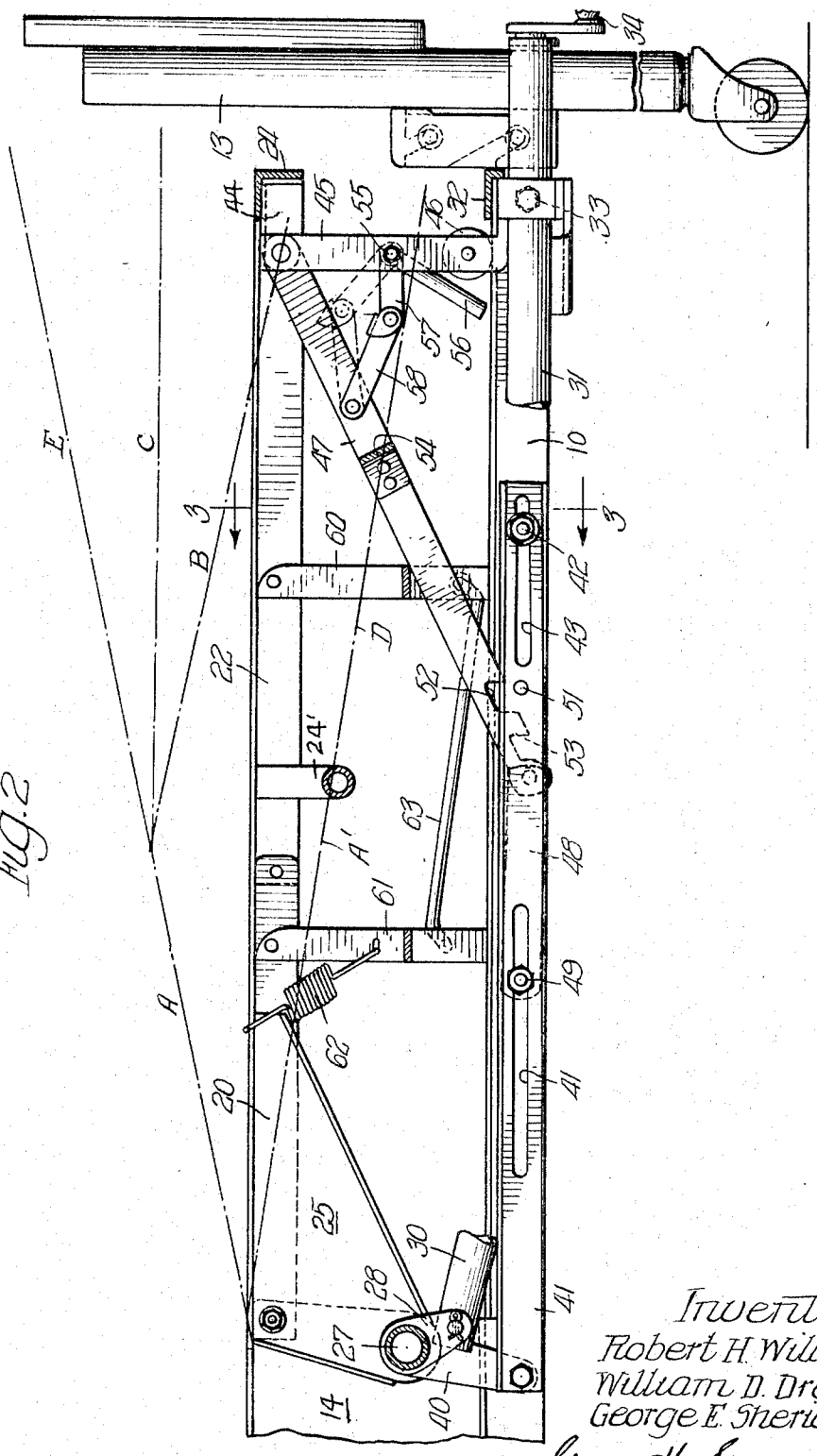


Fig. 2

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HOSPITAL BED

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10 Claims. (Cl. 5—67)

This invention relates to hospital beds and has for its principal object the provision of a new and improved bed of this type.

The main object of the invention is to provide a hospital bed which, in addition to the usual mechanism for elevating the head and thigh sections of the articulated spring frame, contains mechanism enabling the thigh section elevating mechanism to simultaneously elevate the foot section of the spring frame and thereby put the bed in contour position.

Another object of the invention is to provide, in the mechanism for enabling the thigh section elevating mechanism to elevate the foot section, means for disabling that mechanism to permit elevating the thigh section without moving the foot section into contour position.

Another object of the invention is to provide in a hospital bed mechanism enabling the usual mechanism for elevating the thigh section of the spring frame to lower the thigh and foot sections below horizontal to place the bed in reverse Trendelenberg position.

Another object of the invention is to provide, at low cost without sacrificing quality, a hospital bed containing an articulated spring frame that can be placed in contour and reverse Trendelenberg positions by mechanism with which the bed is equipped.

Further objects of the invention not specifically mentioned here will be apparent from the detailed description and claims which follow, reference being had to the accompanying drawings in which a preferred embodiment of the invention is shown by way of example and in which:

FIG. 1 is a plan view of a hospital bed embodying the teachings of the invention;

FIG. 2 is a cross-sectional view taken along the line 2—2 of FIG. 1 looking in the direction of the arrows and drawn to an enlarged scale; and

FIG. 3 is a cross-sectional view taken along the line 3—3 of FIG. 2, looking in the direction of the arrows, and drawn to the same scale as FIG. 2.

Often times the comfort of patients can be enhanced by placing a hospital bed in the so-called contour position. This may be accomplished in the usual hospital bed, having an articulated spring frame, by elevating the head section, elevating the thigh section and elevating the foot section of the spring frame, all to a desired height. The present invention provides, in a hospital bed of the usual and well-known design, mechanism for accomplishing this purpose and, in addition, arranged to permit lowering the thigh and leg sections of the spring frame below horizontal, thereby to place the bed in the reverse Trendelenberg position.

As shown in the drawings, the mechanism of the present invention is applied to a hospital bed of known design in which the head section of the spring frame is moved by a manually operated crank at the foot end of the bed and the thigh sectien is moved by a similar manually operated crank also located at the foot end of the bed. The invention is shown in conjunction with such a manually operated bed to produce a bed that can be manufactured at low cost to render it attractive to hospitals and nursing homes where the more expensive, electrically-operated beds are not desired. While we have chosen to show the invention in conjunction with a manually-operated bed, it will be understood that the

teachings of the invention may be applied to a motor-operated bed and such an application is contemplated.

The invention will be best understood by reference to the accompanying drawings from which it will be seen that the bed shown by way of example contains the usual side rails **10** and **11**, which are supported at the head end of the bed by a headboard assembly **12** of known design. At the foot end of the bed, the rails **10** and **11** are supported by a footboard assembly **13**, likewise of known design forming no essential part of the present invention. Fixed upon the bed rails and extending upwardly therefrom are seat sections supporting brackets **14** to one side of which the head section **15** of the spring frame is pivotally connected as indicated at **16**. Depending from the side portions of the head section **15** are brackets **17** between which a cross member **18**, preferably tubular, is fixed.

Pivotally connected to the other side of the seat section **14** are side rails **20** and **21** of the thigh section of the spring frame. Pivotally connected to the side rails **20** and **21** are the side rails **22** and **23** of the foot section of the spring frame, which rails are connected together at the foot end of the bed by an end member **24**. The usual cross brace **24'** is provided near the junction of the thigh and foot section to stiffen the spring frame.

Attached to the thigh section rail **20** and depending therefrom is a bracket **25**. Attached to and depending from the side rail **21** is a similar bracket **26**. Fixed to and extending between brackets **25** and **26** is a cross member **27**, preferably tubular, to which spaced apart crank arms **28** are fixed in convenient manner, such as by welding.

Pivotally connected to the distal ends of crank arms **28** is a tube **30** which telescopes into a shorter tube **31** that is pivotally supported, as indicated at **33**, upon a cross member **32** that extends between and is secured to rails **10** and **11**.

Journalled within the tube **31** is a screw, not shown, to which crank **34** is fixed. Carried in the end of the tube **30**, which is telescoped into the tube **31**, is a nut, not shown, that is threaded upon the screw to permit operation of the crank **34** to move the thigh section of the spring frame in known manner.

Fixed upon the cross tube **18** are spaced apart crank arms **35**, to the distal ends of which a tube **36** is pivotally connected. Tube **36** telescopes into a shorter tube **37**, in which is journalled a screw, not shown, to which crank **38** is attached. A nut, not shown, carried on the tube **36** and threaded upon the screw permits operation of the crank **38** to move the head section of the spring frame in known manner.

The structure thus described will be recognized as the usual and well-known hospital bed structure, which may be of the hi-low variety if desired. The hi-low mechanism has been omitted from the drawings since it may be of known design and since it forms no essential part of the present invention. The spring frame is equipped with the usual spring fabric which has been omitted from the drawings to avoid an unnecessary complication thereof.

As will be seen best in FIGURE 2, a crank arm **40** is fixed upon the cross tube **27** and depends therefrom. A slide bar **41**, preferably angular in cross section, is pivotally connected to the crank arm **40** and extended along the side rail **10** of the bed frame towards the foot end thereof. Located near the foot end of the bed frame and supported in the side rail **10** is a collared bolt **42** which projects through a slot **43** in the bar **41** to support the bar on the side rail while permitting longitudinal movements of the bar with respect to that rail.

Pivotally connected to a bracket **44** that is attached to the end member **24** of the spring frame and depending therefrom is a levelizer **45** which is equipped with a roller

46 at its lower end, which roller engages the side rail 10 to support the foot section of the spring frame in horizontal position above the side rails of the bed.

Pivotally connected to the bracket 44 coaxially with the pivotal connection of the levelizer 45 therewith is a rack bar 47 which extends downwardly and is disposed between bar 41 and the side rail 10. A link 48 pivotally connected to the distal end of the rack bar 47 is connected to the bar 41 by a bolt 49 which projects through a slot 50 in the bar 41.

A pin 51 fixed in the bar 41 extends outwardly therefrom towards the side rail 10, which pin is disposed beneath the rack bar 47. Contained in the lower edge of the rack bar 47 is a notch 52 that normally lies above the pin 51 and is spaced from a similar notch 53.

The mechanism thus described is duplicated on the other side of the bed with corresponding parts bearing the same reference numerals primed.

Bar 41' corresponding to bar 41 lies alongside of the side rail 11 of the bed frame. Journalled in and extending between the levelizers 45 and 45' is a rod 55 that contains a handle-like portion 56 at each of its ends to permit the rod to be rotated around its axis. Fixed upon the rod 55 is a toggle link 57 to which a second toggle link 58 is pivotally connected, the link 58 being also pivotally connected to the rack bar 47. As shown in FIGURE 2, the toggle links 57 and 58 are in operated position, and with these links in this position, an operation of the crank 34 to elevate the thigh section of the spring frame permits such elevation without elevating the foot section of the spring frame in horizontal position, this section being positioned as indicated by the broken line B in FIGURE 2.

Toggle links 57 and 58 are duplicated on the opposite side of the bed with link 58' pivotally connected to rack bar 47'. Rack bars 47 and 47' are connected together by a cross brace 54.

When it is desired to place the spring frame in contour position, arm 56 is moved to rotate rod 55 clockwise, as seen in FIGURE 2. This movement breaks the toggle links 57 and 58, moving them into the position shown in dotted lines. This movement of the toggle permits the rack bar 47 to drop to engage the pin 51 in the notch 52. Crank 38 is then operated to elevate the head section of the spring frame, after which crank 34 is operated to elevate the thigh section. This operation of the crank 34 also moves the bar 41 towards the foot end of the bed, and engagement of the pin 51 in the notch 52 causes this movement of the bar 41 to elevate the foot section of the spring frame simultaneously with the elevation of the thigh section thereof. As a result, the thigh and foot sections of the spring frame are placed in the position represented by broken lines A–C. Slot 43 in the bar 41 is long enough to permit longitudinal movement of the bar while the thigh section is being elevated to its upper limit position.

There may be instances where it is desirable to elevate the foot section of the spring frame above the horizontal position that it occupies when the frame is in contour position. To accomplish this with the spring frame in horizontal position, the foot section is manually lifted. The slot 50 in the bar 41 is long enough to permit the bolt 49 to slide during such movement. With the notch 52 engaged with the pin 51, the spring frame will be in angular alignment with the elevated thigh section as indicated at A, and if further elevation of the foot section is desired, the pin 51 can be registered with the slot 53 in the rack bar. The foot section will then occupy the position indicated by broken line E.

As will be seen best in FIGURES 2 and 3, a levelizer 60 is pivotally connected at its extremities to side rails 22 and 23 of the foot section of the spring frame. This levelizer extends inwardly and downwardly from the spring frame and contains a horizontal portion that engages the side rails 10 and 11 to hold the foot section in horizontal position. The levelizer extends upwardly from the rails 10 and 11 and thence laterally across the bed, as indicated in FIGURE 3.

Pivotally connected to the side rails 20 and 21 of the thigh section of the spring frame near the junction of that section to the foot section is a levelizer 61, which is identical in construction and purpose to the levelizer 60. A spring 62 connected between the spring frame and the levelizer 61 is tensioned to hold levelizer 61 in the position shown in FIGURE 2. It will be noted that, with the levelizers 60 and 61 disposed at right angles to the spring frame, the upper ends of these levelizers engage the flange portion of the spring frame to prevent rotation of the levelizers about their pivotal connections to the spring frame clockwise beyond this vertical position. Interconnected between the vertical portions of the levelizers 60 and 61 is a tie rod 63. It will be noted that the right-hand portions of the upper ends of the levlizers, as seen in FIGURE 2, are arcuate and rotation of one levelizer counterclockwise, as seen in this figure, rotates the other levelizer against the tension of spring 62.

When it is desired to place the spring frame in reverse Trendelenberg position, toggle links are broken by being moved into the dotted line position, levelizers 45 and 45' are moved clockwise around their pivotal connection to the spring frame, as seen in FIGURE 2, levelizers 60 and 61 are rotated counterclockwise and crank 34 is operated to lower the thigh section below horizontal and thereby move the bar 41 to the left, as seen in this figure. This movement of the bar 41 moves the pin 51 to the left, permitting the foot section to be lowered below horizontal, the engagement of the pin 51 in a notch 52 in the rack bar maintaining the foot section of the spring frame aligned with the thigh section thereof, these sections being moved into the position indicated by the broken line A'–D, thereby to place the spring frame in reverse Trendelenberg position.

From the foregoing, it will be apparent that the mechanism of the present invention permits operation of the manual crank in one direction, to elevate the thigh section, to simultaneously move the foot section of the spring frame thereby to put that frame in contour position. The mechanism also permits operation of the crank in reverse direction to lower the thigh and foot sections of the spring frame below horizontal, thereby to put the spring frame in reverse Trendelenberg position. With the spring frame in contour position, the foot section of that frame can be manually elevated above horizontal when desired.

While we have chosen to illustrate our invention by showing and describing a preferred embodiment of it, we have done so by way of example only as there are many modifications and adaptations which can be made by one skilled in the art within the teachings of the invention.

Having thus complied with the statutes and shown and described a preferred embodiment of the invention, what we consider new and desire to have protected by Letters Patent is pointed out in the appended claims.

We claim:

1. In a hospital bed having side rails supported in horizontal position above a floor and having a normally horizontal articulated spring frame containing a seat section fixed upon the rails, a head section pivotally connected to one side of said seat section, a thigh section pivotally connected to the other side of said seat section and a foot section pivotally connected to the distal end of the thigh section; mechanism for placing said spring frame in contour and reverse Trendelenberg positions, which mechanism comprises:

(a) a first means for moving said head section into position inclined with respect to horizontal;

(b) a second means for moving said thigh section into position inclined with respect to horizontal;

(c) a third means operated by an operation of said second means for elevating said foot section while maintaining the same horizontal;

(d) and a fourth means operable to permit an operation of said third means to move the thigh and foot sections downwardly from horizontal to place the spring frame in reverse Trendelenberg position.

2. Hospital bed mechanism as specified in claim 1 in which the second means includes a cross member fixed to the thigh section below the pivotal connection of that section to the seat section, a crank arm fixed on said member and depending therefrom and screw means connected to said crank arm and operable to move the thigh section and in which a pair of crank arms are fixed on said member and depend therefrom one adjacent each side rail of the bed.

3. Hospital bed mechanism as specified in claim 2 in which the third means consists of a bar pivotally connected to each one of said pair of crank arms and supported on the adjacent side rail for movement longitudinally responsive to operations of said second means, and a rack bar interconnected between each of said bars and the distal end of the foot section for transmitting said movement of the bars to the foot section.

4. Hospital bed mechanism as specified in claim 3 in which the rack bars are pivotally connected to the foot section of the spring frame adjacent the distal end thereof and contain notches adapted to register with pins carried upon the bars to establish driving connections between the bars and the foot section.

5. Hospital bed mechanism as specified in claim 4 in which a guide link is pivotally connected to the distal end of each of said rack bars and to a bolt slidable in a slot in the associated bar, said guide links serving to steady in the distal ends of the rack bars during movements thereof around their pivotal connections to the foot section of the spring frame.

6. Hospital bed mechanism as specified in claim 4 in which the fourth means includes a plurality of levelizers pivotally connected to the thigh and foot sections of the spring frame and normally disposed at right angles thereto and engaging the side rails to hold the sections in horizontal position, said levelizers being rotatable out of normal position to permit lowering the spring frame sections below horizontal.

7. Hospital bed mechanism as specified in claim 6 in which the first one of said levelizers is pivoted to the distal end of the foot section and in which toggle means, pivotally connected to said levelizer and to said rack bars in operated position raise the rack bars out of engagement with said pins to permit said second means to move the thigh section without moving the foot section into contour position.

8. Hospital bed mechanism as specified in claim 7 in which the toggle means includes a pair of toggle links, one on each side of the bed, and in which a cross rod journaled in said first levelizer connects together said pair of links and is equipped with an operating handle at each of its ends to permit operation of the toggle links from either side of the bed.

9. Hospital bed mechanism as specified in claim 6 in which a second one of said levelizers is pivotally connected to the foot section near the longitudinal middle thereof, a third one of said levelizers is pivotally connected to the thigh section adjacent the junction of the foot section therewith, tie rods connect together said second and third levelizers and spring means extending between the thigh section and said third levelizer is tensioned to urge said levelizers into normal position, said tie rods causing rotation of one of the levelizers toward the foot end of the bed to rotate both levelizers preparatory to placing the sections in reverse Trendelberg position.

10. Hospital bed mechanism as specified in claim 4 in which collared bolts fixed on the rails extend inwardly therefrom and through slots in said bars to support the bars a fixed distance from the rails, said bolts being registered with said notches, when the foot section is manually elevated from contour position, to hold the foot section elevated and in substantial alignment with the inclined thigh section.

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