United States Patent [19]

Stryker

[11] **3,832,742**

[45] **Sept. 3, 1974**

[54] **END SUPPORT FOR ANTERIOR BED FRAME**

[75] Inventor: **Homer H. Stryker,** Kalamazoo, Mich.

[73] Assignee: **Stryker Corporation,** Kalamazoo, Mich.

[22] Filed: **Feb. 26, 1973**

[21] Appl. No.: **335,480**

Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 260,367, June 7, 1972, abandoned.

[52] **U.S. Cl.** ..... **5/62,** 5/81 R

[51] **Int. Cl.**..... **A61g 7/10,** A61g 7/06

[58] **Field of Search**..... 5/60–62, 63, 5/66–68, 81 R, 86; 128/24, 33

[56] **References Cited**

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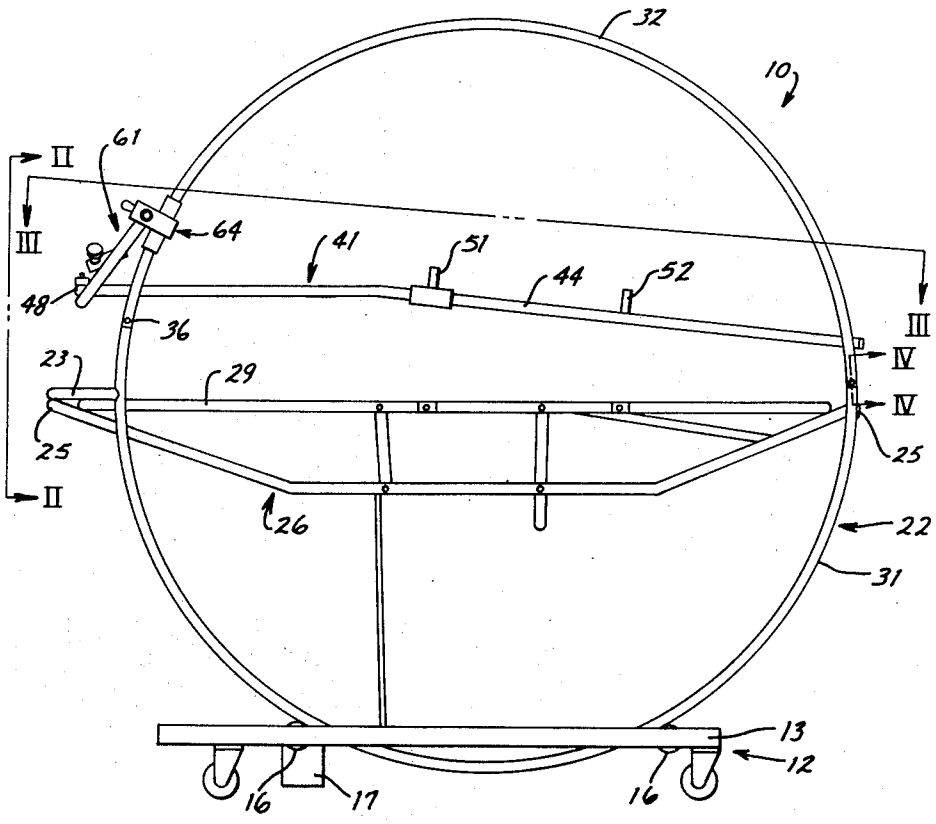
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Primary Examiner—Casmir A. Nunberg
Attorney, Agent, or Firm—Woodhams, Blanchard and Flynn

[57] **ABSTRACT**

An end support for the anterior frame of a rotatable hospital bed having opposed, relatively movable anterior and posterior patient supporting frames. The end support has a bar which extends between spaced, parallel and generally upright side rings of the bed. The ends of the end support bar are secured to the side rings by lock units. When the lock units are in their unlocked condition, they can slide along the corresponding side rings for adjusting the distance between the end supports, hence, the anterior frame and the posterior frame of the bed. The lock unit includes pin means engageable with the side rings and resiliently urged to remain in any of several selected positions therealong. The end support bar is mounted on the lock units for limited pivotal movement around an axis parallel with the rotational axis of the bed. The end support bar is resiliently biased toward one pivotal limiting position wherein said end support bar overlaps the end of said anterior frame. In a modified embodiment, the end support bar is not resiliently held but is pivotable on the lock unit through an extended angular range, between a limit position determined by an adjustment screw wherein the end support is engageable with the anterior frame, and a second limit position thereabove and wherein a support lock pin automatically locks the end support bar against pivotal movement in an upwardly extending intermediate position.

16 Claims, 13 Drawing Figures



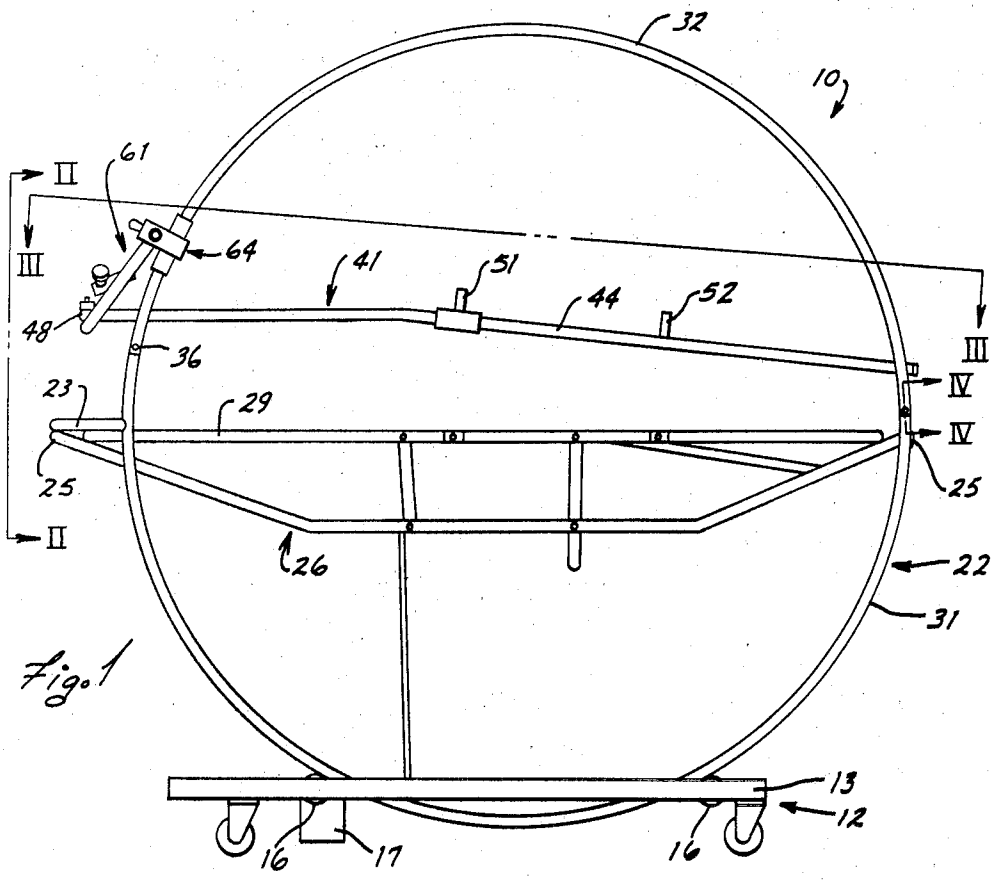

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Fig. 1

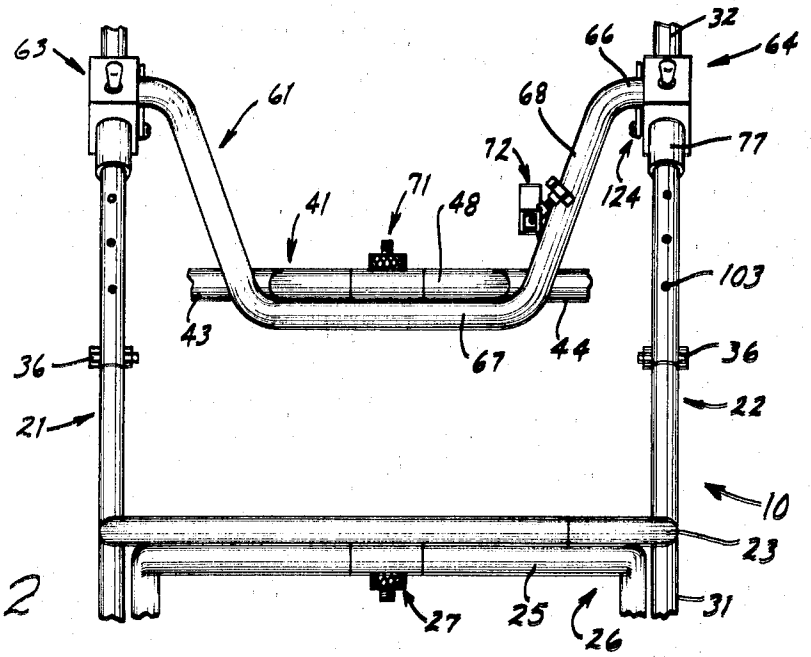
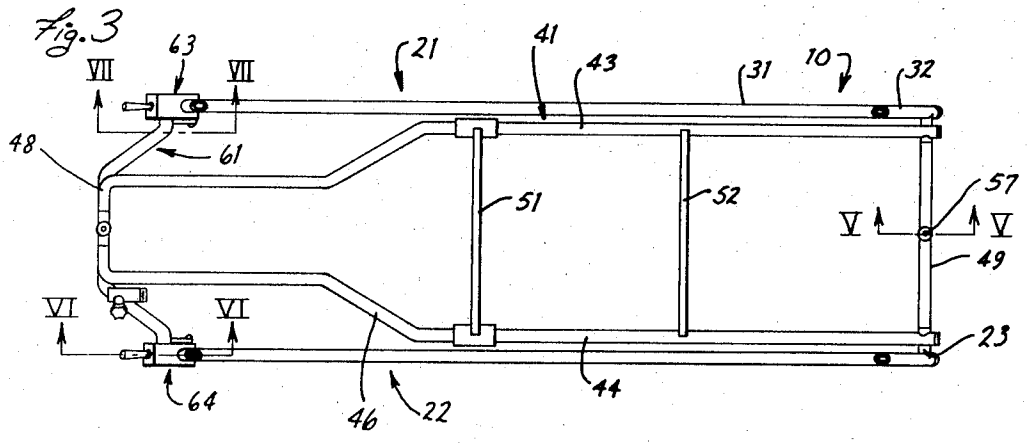

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Fig. 2

Fig. 3



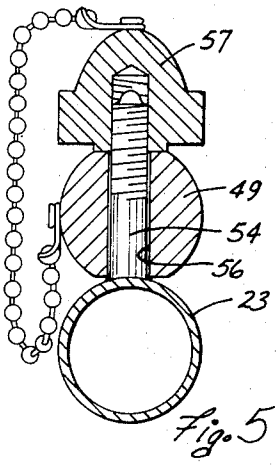


Fig. 5

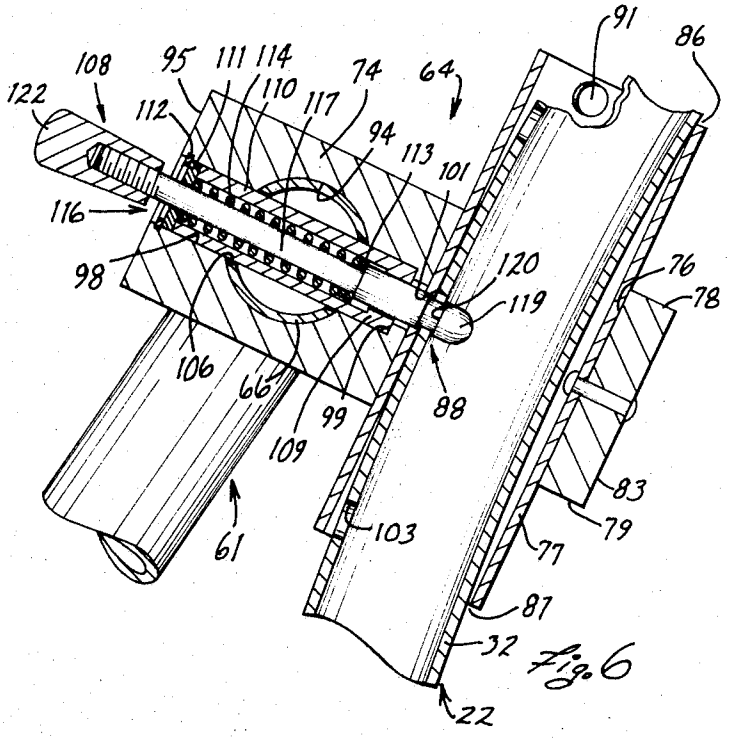


Fig. 6

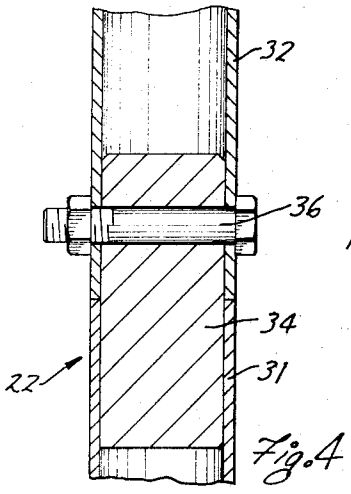


Fig. 4

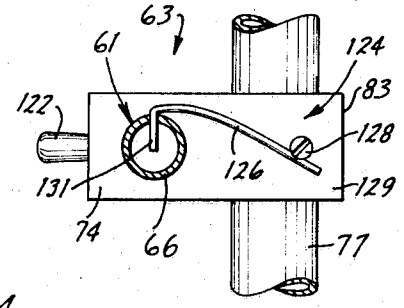
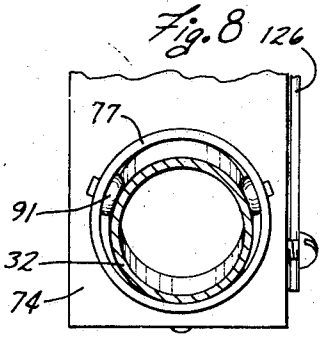


Fig. 7

Fig. 8



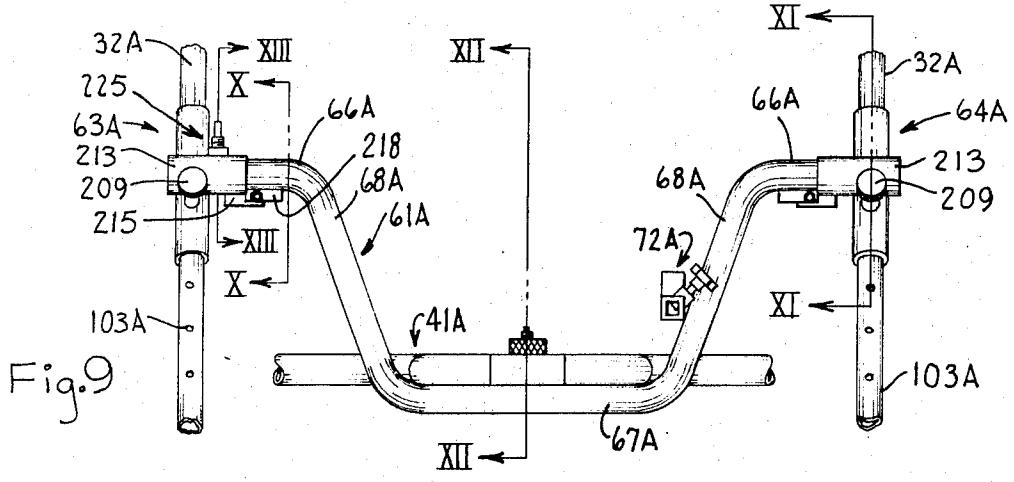


Fig.9

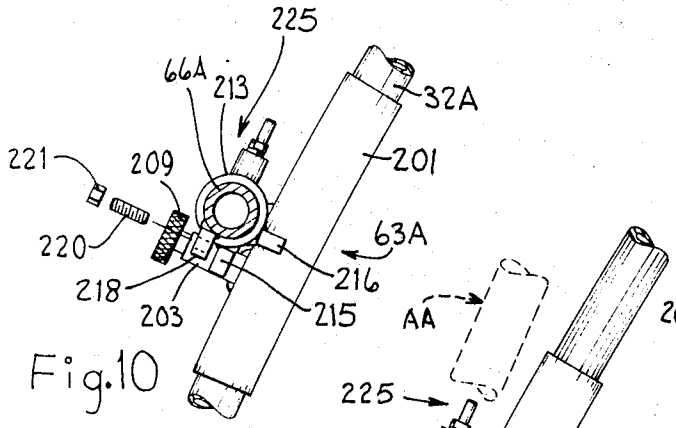


Fig.10

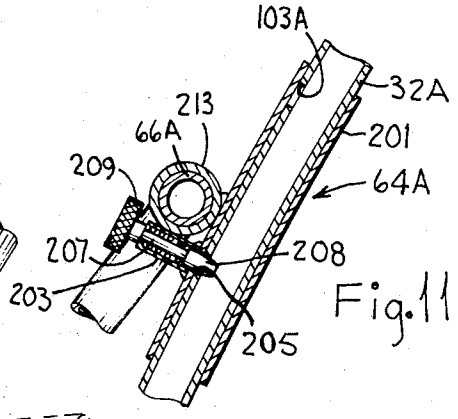


Fig.11

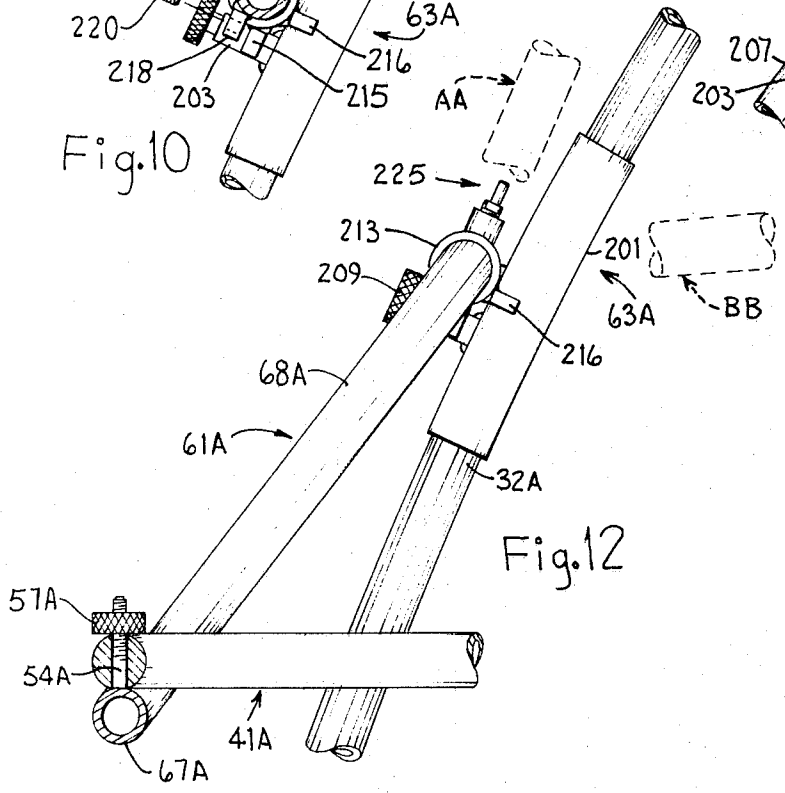


Fig.12

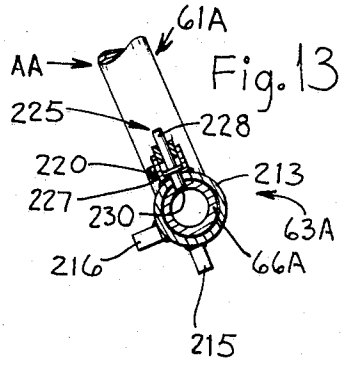


Fig.13

END SUPPORT FOR ANTERIOR BED FRAME

CROSS REFERENCE TO RELATED APPLICATION

This application is a continuation-in-part application of co-pending application Ser. No. 260,367, filed June 7, 1972 by Homer H. Stryker, entitled "End Support for Anterior Bed Frame," and now abandoned.

FIELD OF THE INVENTION

This invention relates to an improvement in a bed having anterior and posterior frames for engagement of a patient and, more particularly, to an end support for the anterior frame of a hospital bed having upstanding, circular and rotatable side members enabling end-for-end rotation of a patient supported between said frames.

BACKGROUND OF THE INVENTION

U. S. Pat. No. 3,034,152, assigned to the assignee of the present invention, discloses a hospital bed of the general type involved. It is contemplated that the present invention could be applied to other bed constructions of more or less related type, even though said invention was developed in connection with the bed of the type disclosed in said U. S. patent.

Briefly, a bed of the type disclosed in said U. S. patent includes a pair of spaced circular and coaxial rings arranged in vertical planes and connected to each other by cross bars. The rings are supported upon a wheeled base for rotation about their common axis. A posterior frame extends diametrically across and between the rings to support a mattress which normally engages the patient's back. An anterior frame extends across and between the rings on the mattress side of the posterior frame and is spaced therefrom. The anterior frame is equipped with a mattress or the like.

The anterior frame is movable toward and away from the posterior frame and it may be adjusted so that the patient can be held snugly between the two frames during rotation of the rings whereby the posterior and anterior frames are rotated through approximately 180° and the patient is moved from a face down position to a face up position, or the reverse. Such a bed is particularly useful where, for example, the patient is in traction or requires treatment which necessitates frequent changing of the patient's position.

Adapting the anterior frame to movement toward and away from the patient has in the past been accomplished by pivotally mounting the foot end thereof between the rings and frictionally clamping a support for the head end of the anterior frame to the rings by means of releasable friction clamps. Repositioning of the head end of the anterior frame may thus be utilized to adjust for differences in the thickness or girth of different patients to be supported by the bed and to facilitate insertion and removal of the patient from the bed. It has been found, however, that careless readjustment of clamping force by the hospital personnel or others may interfere with proper operation of the clamps, for example, resulting in excessive operating effort or reduction in clamping force below desired levels.

Thus, the objects of this invention include provision of:

1. An improved end support for the anterior frame of a hospital bed of the type disclosed in U. S. Patent No. 3,034,152 and having a support member secured by positively locking but releasable lock units in any of several predetermined positions circumferentially spaced along opposed portions of the side rings to adjust said anterior frame relative to the head end of the posterior frame.

2. An end support, as aforesaid, in which the lock units positively engage the rings both for circumferential movement therealong and for locking against circumferential movement with respect thereto and in which the occurrence of such locking is automatic upon movement of the lock unit to any of several preselected positions along the adjacent ring.

3. An end support, as aforesaid, in which accidental circumferential displacement of the lock units and hence of the head end of the anterior frame with respect to the rings in precluded and in which manual force is required to unlock such lock units and enable circumferential adjustment of said support member with respect to said rings.

4. An end support, as aforesaid, in which the head end of the anterior frame is adapted to be fastened in overlapping relation to a central, offset portion of the end support bar, the ends of which are connected to said lock units for limited pivotal movement relative thereto. This pivotal movement permits displacement of the central portion of the bar out of overlapping relation with the head end of the anterior frame to allow noninterfering movement thereof with respect to the end support bar.

Other objects and purposes of this invention will become apparent to persons acquainted with apparatus of this general type upon reading the following specification and inspecting the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a side elevational view of a rotatable hospital bed including an anterior frame having an end support embodying the present invention.

FIG. **2** is an enlarged fragment of FIG. **1** substantially as viewed from the line II—II.

FIG. **3** is a sectional view substantially as taken on line III—III of FIG. **1.**

FIG. **4** is an enlarged sectional view substantially as taken on the line IV—IV of FIG. **1.**

FIG. **5** is an enlarged sectional view substantially as taken on line V—V of FIG. **3.**

FIG. **6** is an enlarged sectional view substantially as taken on line VII of FIG. **3.**

FIG. **7** is an enlarged sectional view substantially as taken on line VII—VII of FIG. **3.**

FIG. **8** is a sectional view substantially taken on line VIII—VIII of FIG. **6.**

FIG. **9** is a fragment of FIG. **2** disclosing a modification.

FIG. **10** is an enlarged, fragmentary, partly exploded, sectional view substantially as taken along the line X—X of FIG. **9.**

FIG. **11** is an enlarged fragmentary sectional view substantially as taken along the line XI—XI of FIG. **9.**

FIG. **12** is an enlarged fragmentary sectional view substantially as taken along the line XII—XII of FIG. **9** and showing, in broken lines, alternate pivotal positions of the end support bar.

FIG. **13** is an enlarged fragmentary sectional view substantially as taken along the line XIII—XIII of FIG.

9 and showing the end support bar pivoted upwardly to its normal out-of-use position, corresponding to its intermediate position of FIG. 12.

SUMMARY OF THE INVENTION

The objects and purposes of the invention, including those set forth above, have been met by providing an improved end support for the anterior frame of a rotatable hospital bed having opposed relatively movable anterior and posterior patient supporting frames. The end support has a bar which extends between the spaced, parallel and upright side rings of the bed. The ends of the end support bar are secured to corresponding ones of said side rings by lock units. When the lock units are in their unlocked condition, they can slide along the corresponding side rings for adjusting the distance between the end support, hence the head end of the anterior frame, and the posterior frame of the bed. The lock unit includes pin means engageable with the side rings and resiliently urged to remain in any of several selected positions therealong. The end support bar is mounted on the lock units for limited pivotal movement around an axis parallel with the rotational axis of the bed. The end support bar is resiliently biased toward one pivotal limiting position wherein said end support bar overlaps the end of said anterior frame. In a modified embodiment, the end support bar is not resiliently held but is pivotable on the lock unit through an extended angular range, between a limit position determined by an adjustment screw wherein the end support is engageable with the anterior frame, and a second limit position thereabove and wherein a support lock pin automatically locks the end support bar against pivotal movement in an upwardly extending intermediate position.

DETAILED DESCRIPTION

FIGS. 1 through 3 disclose a bed 10 having an anterior frame support embodying the invention. The bed includes a substantially rectangular base 12 (FIG. 1) preferably supported by casters 14. Two pairs of spaced rollers 16 are rotatably supported on the base 12, and a motor 17 is carried by said base for rotatably driving at least one roller 16.

A pair of spaced, circular, coaxial and vertically disposed side rings 21 and 22 are connected together by circumferentially spaced transversely extending cross bars, one of which is shown at 23 (FIG. 2), to define a rigid cylindrical unit. The rings 21 and 22 are supported on and between the rollers 16 for rotation with respect to the base 12 as seen in FIG. 1.

A posterior frame 26, preferably of rectangular plan, extends substantially diametrically across the rings 21 and 22 and is disposed transversely therebetween. The ends 25 of the posterior frame 26 are removably secured, preferably by nut and threaded stud connections 27 (FIG. 2) to adjacent ones of the cross bars 23. The posterior frame includes a patient support 29 for supporting the back of a patient, and may for example include a mattress, not shown. If desired, the patient support 29 may be articulated to allow either flat or flexed support of the patient.

The rings 21 and 22 are preferably of two piece construction. Each ring includes a lower semicircular portion 31, here extending through slightly more than 180° of arc, which carries and terminates above the posterior frame 26. The ends of the upper semicircular portion 32 of each ring are removably fixed to the ends of the corresponding lower portion 31. To this end, plugs 34 (FIG. 4) fixed within the ends of the lower ring portions 31 are snugly but slidably received in the opposed ends of the corresponding upper ring portions 32 and fixed thereto by a nut and bolt connection 36, the bolt extending through suitable coaxial openings in the plug and upper ring portion end. In consequence, the upper ring portions 32 can be removed to enable free access to the patient supported on the posterior frame, as for treatment, operations and the like without removing the patient from the bed 10.

An anterior frame 41 (FIG. 1) extends substantially chordally across the rings 21 and 22 and is disposed transversely therebetween. The anterior frame is disposed in spaced opposition to the posterior frame 26 and is carried by the upper ring portions 32 in a manner hereinafter described. In the particular embodiment shown, the anterior frame 41 comprises spaced side members 43 and 44 (FIG. 3) which at their foot or rightward ends and for the majority of the length thereof are relatively widely spaced lying just inside planes of the rings 21 and 22. The head or leftward ends of the side members 43 and 44 are more closely spaced and are joined to the foot ends of the side members 43 and 44 by angled portions, one of which is indicated at 46. The head or leftward end of the side members 43 and 44 are joined, here integrally, by a head element 48 extending transversely therebetween. The rightward or foot ends of the side members 43 and 44 are joined by a transverse foot element 49. The central portions of the head and foot elements 48 and 49 are pivotable with respect to the end portions thereof for purposes appearing hereinafter. Intermediate elements 51 and 52 join the side members 43 and 44 intermediate their ends and are preferably of inverted U-shape. A mattress or the like, not shown, is preferably carried by the anterior frame in opposed relation to the posterior frame.

As seen in FIG. 3, the foot element 49 of the anterior frame 41 rests on and is releasably secured to another one 53 of the cross bars connecting the rings 21 and 22. The cross bar 53 extends between the upper ring portion adjacent and above the rightward ends of the lower ring portions 31. A threaded stud 54 (FIG. 5) is fixed to and extends upwardly from the central portion of cross bar 53 and is received through a diametral opening 56 in the foot element 49. A nut 57, here held captive to the foot element 49 by a chain 58, threadedly engages the free end of the stud 54 to fixedly but releasably secure the central portion of the foot element 49 of the anterior frame to the cross bar 53.

The head or leftward end of the anterior frame 41 is carried by an end support bar 61 (FIGS. 1, 2 and 3) adjustably positioned on the upper portions 32 of rings 21 and 22 by lock units 63 and 64 described in more detail hereinafter.

The support bar 61 has coaxial ends 66 (FIG. 2) which engage the lock units 63 and 64. The central portion 67 of the support bar parallels but is radially offset from the ends 66 and integrally connects thereto by divergent angled portions 68. In its position of use indicated in FIG. 1, the central portion 67 of support bar 61 depends from and is outwardly angled from the lock units 63 and 64 supporting same. Further, the head element 48 of the anterior frame is supported on the central portion 67 between the angled portions 68 and is

affixed thereto by a stud and nut connection **71** which is preferably generally similar to that used at the foot end of the anterior frame and shown in FIG. **5.**

If desired, accessory mounting devices such as that shown at **72** (FIG. **2**) may be fixed to the support bar **61.**

The lock unit **63** and **64** are preferably mirror images of each other. Thus, a description of lock unit **64** will suffice for both. The lock unit **64** comprises a block **74,** here substantially rectilinear in form. A transverse opening **76** (FIG. **6**) extends through the block **74** adjacent the rightward end thereof. A cylindrical sleeve **77** is snugly received within and extends through the opening **76** and its ends extend beyond the upper and lower faces **78** and **79** of the block **74,** each by a distance here approximating the thickness of the block. A rivet **82** extends through coaxial openings in the interior end **83** of the block **74** and side wall of the sleeve **77** for fixedly securing the sleeve to the block. The rivet **82** is preferably aligned diametrically of the sleeve and located on the central length axis of the block.

The upper ring portion **32** is slidably through the sleeve **77.** The sleeve **77** is preferably linear in contrast to the arcuate character of the ring extending therethrough. The inside diameter of the sleeve **77** exceeds the thickness of the ring portion **32** so that the ring directly contacts the sleeve wall only at the interior portion of the sleeve ends, as indicated at **86** and **87** (FIG. **6**), and centrally of the sleeve at the exterior side facing zone **88** thereof. The ring portion **32** is elsewhere spaced from the sleeve **77** and at least slidably clears the adjacent end of rivet **82.**

A pair of plugs **91** are provided adjacent each end of the sleeve **77.** The plugs are conveniently rivets extending through the wall of sleeve **77** and having heads therewithin. The plugs **91** of each pair of each spaced by more than a quarter circle, for example 110°, circumferentially of the sleeve from the rivet **82.** The plugs **91** of each pair are thus circumferentially spaced from each other in a symmetrical manner on opposite sides of the radial plane of the ring **22.** The heads of the plugs **91** slidably contact the exterior surface of the ring **22** so that each end of the sleeve **77** engages the opposed surface of the ring **22** at three circumferentially distributed points around the perimeter of such sleeve end, thereby reducing any tendency for the sleeve to more with respect to the ring except along the circumference of such ring. On the other hand the surface contact between the ring and sleeve is relatively small easing movement of the sleeve along the ring.

A transverse opening **94** extends through the exterior (leftward in FIG. **6**) end portion of the block **74.** The opening **94** is spaced exteriorly from the opening **76** and extends through the side walls of the block. As seen from the exterior end **95** of the block, the axes of openings **94** and **76** appear substantially perpendicular. The end **66** of support bar **61** extends snugly but pivotally into the opening **94.**

An elongated lock opening **98** (FIG. **6**) extends along the central longitudinal axis of the lock block **74** from the exterior end **95** thereof diametrally through opening **94** and diametrally into opening **76.** The portion of lock opening **98** communicating with opening **76** is of reduced diameter to form a step **99.** A hole **101** through the sleeve **77** coaxially communicates with the longitudinal lock opening **98** and corresponds in diameter to the adjacent portion of the opening **98.** A plurality of holes **103** are spaced, preferably evenly, along the exterior face of the ring **22** (and correspondingly of ring **21**). As seen in FIG. **2,** the series of holes **103** extends from the connection **36** upwardly along the upper portion **32** of ring **22** for a distance corresponding to the desired range of circumferential placement of lock unit **64.**

The end **66** of end support **61** is provided with a diametral opening **106** normally in coaxial alignment with lock opening **98** but exceeding the diameter thereof, for example by 0.050 inch to 0.090 inch, for purposes appearing hereinafter.

A lock plunger assembly **108** (FIG. **6**) is housed in the lock opening **98.** The plunger assembly includes a lock sleeve or casing **110** snugly but slidably received in the opening **98** against the step **99.** The interior end of the sleeve **110** has a radially inwardly directed, annular flange **109.** A snap ring **112** removably located in a groove in the leftward end of the opening **98** retains a washer **111** and the sleeve **110** coaxially within the opening **98.** The lock sleeve **110** thus extends through opening **106** in the end **66** of the end support **61** and with sufficient clearance as to allow limited pivotal movement of the offset end support with respect to the lock block.

A coil spring **114,** under compression, lies coaxially within the sleeve **110** and is retained therein at one end by the flange **109** and an intervening washer **113** and at the other end by the washer **111.**

A lock pin or plunger **116** includes a shank **117** slidably received within the spring **114** and sleeve **110** and which is guided for reciprocation by the washer **111.** An enlarged, substantially cylindrical head **119** extends coaxially rightwardly from the shank and is guided for reciprocation within the flange **109.** The head abuts the washer **113.** In the locking position of the plunger assembly **108** shown in FIG. **6,** the head extends rightwardly past the shoulder **99** through the sleeve hole **101** and a desired one of the ring holes **103** into the ring **22** for preventing movement of the lock block **74** circumferentially along the ring, and hence for positively locating the end **66** of end support **61** circumferentially on the ring **22.** The head **119** is preferably grooved at **120** to lightly resist movement out of the hole **103,** so as to prevent removal by inadvertence and indicate to the user that the plunger has properly engaged the ring **22.** A manually engageable knob **122** is threaded on the outer end of the shank **117** for pulling the plunger **160** out of engagement with the holes **103** in ring **22.**

One, and preferably both, of the lock units **63** and **64** are provided with a bias device **124** (FIG. **7**) for pivotally urging the end support **61** away from the rings **21** and **22** out of overlapping relation with the adjacent end **48** of the anterior frame **41.** In the preferred embodiment shown, the bias device **124** comprises a substantially L-shaped leaf spring **126,** here a resilient rod. The outboard (leftward) end **131** of the spring **126** extends through an opening in the peripheral wall of the anterior frame support end **66** into the interior thereof. The other end of the spring **126** is held beneath a screw **128** extending laterally from the side wall **129,** preferably the interior side wall, of the lock block **74,** near the inboard end wall **83.** The intermediate portion of the spring **126** is at all times subjected to a resilient bending force by the connection of its ends to support end **66** and screw **128** and so constantly urges the interior frame support end **66** to the clockwise limit (as seen in

FIG. 7) of its pivotal movement allowed by the currents between opening **106** and lock sleeve **110** of FIG. **6.**

OPERATION

To assemble the anterior frame end support **61** and lock units **63** and **64,** the ends **66** of support **61** are inserted in openings **94** in the lock blocks **74,** with the opening **106** of each support end being aligned with the lock opening **98** in the corresponding lock block For each lock unit, the washer **113,** spring **114,** washer **111** and snap ring **112** are preferably then slid onto the threaded end of the plunger **117** and the resultant subassembly is inserted into the sleeve **110.** The knob **122** is threaded onto the threaded end of the plunger shank **117.** The resultant assembly is inserted into the longitudinal lock opening **98** of the lock block **74,** the sleeve **110** abutting the step **99** and the head **119** extending into the sleeve **77** of the lock block **74.** The snap ring **112** is then snapped into its groove in lock opening **98** to hold the plunger assembly and sleeve **110** in place as in FIG. **6.**

The thus assembled lock units **63** and **64** and support **61** are installed on the rings **21** and **22** by separating the upper and lower ring portions **31** and **32** thereof and inserting the free leftward (as seen in FIG. **6**) ends of the upper ring portions **32** into the sleeves **77** of the corresponding lock units. As such as carried out, each plunger knob **122** is manually pulled to retract the plunger head **119,** against the force of the spring **114,** further into the sleeve **110** to clear the interior of sleeve **77.** The lock units **63** and **64** may then be freely shifted along the upper ring portions **32,** into alignment with the desired one of the holes **103** in each of the upper ring portions **32.** The knobs **122** are then released which in each case allows the spring **114** to urge the head **119** of the plunger through such opening **103** into the interior of the adjacent ring portion **32** as seen in FIG. **6.** Alternately, the knobs **122** may be released as the lock units near their desired locations on the rings, the plungers automatically entering the holes **103** in the rings when opposed thereto. In this manner, the anterior frame end support **61** is positively and fixedly located on the rings.

To move the support **61** along the upper ring portions **32,** for example to raise or lower same from its position of FIG. **1,** each of the plunger knobs **122** is again manually pulled to retract the plunger head **119** from the engaged one of the holes **103** and the anterior bar and support **61** and locking units **63** and **64** are then manually shifted along the circumference of the rings to a desired new location whereat the plungers are released so that the head **119** of each thereof extends into lock engagement with a new one of the holes **103** in the corresponding ring.

Installation of the anterior frame on rings **21** and **22** is carried out by placing the foot element **49** thereof over the stud **54** (FIG. **5**) and locking the foot element **49** in place on the cross bar **53** with the nut **57.** When so positioned, the anterior frame is pivotable at least through a limited arc corresponding to the portion of circumference of the rings along which the lock units **63** and **64** are movable and lockable.

The clearance between shell **110** and opening **106** (FIG. **6**) permits the leaf springs **126** to swing the central portion of end support **61** leftwardly, as seen in FIGS. **1** and **3,** away from the rings **21** and **22** to allow the head end of the anterior frame to be pivoted upwardly therepast. Thereafter, the support **61** is manually displaced rightwardly toward the rings **21** and **22.** The anterior frame is then placed upon the central portion of the support **61** and secured thereto by the connection **71.**

The pivot range of the support **61** on the lock blocks **74** is sufficient to accommodate differences in the radial location of the anterior frame head end, with respect to the rings **21** and **22,** as the lock units are moved along the rings, in addition to the aforementioned pivotal movement of the support central portion **48** into and out of overlapping relation with the anterior frame.

The head end of the anterior frame may be disengaged from the support **61** when a patient is placed in the bed between the posterior and anterior frames so that the anterior frame can be swung away from the posterior frame to allow the patient to be freely maneuvered into a position therebetween. On the other hand, repositioning of the lock units **63** and **64** along the perimeter of the rings **21** and **22,** either with or without attachment of the anterior frame to the support **61,** may be carried out for a variety of purposes including location of the anterior frame at a spacing from the posterior frame commen surate with the girth of the patient to be disposed therebetween or under conditions wherein it may be desirable to support the patient on his back on the posterior frame with the anterior frame spaced from him.

MODIFICATION

FIGS. **9** through **13** disclose a modified apparatus. Portions of the apparatus of FIGS. **9** through **13** corresponding to portions of the apparatus of FIGS. **1** through **8** above described will carry the same reference numeral with the suffix "A" added thereto.

The apparatus of FIGS. **9** through **13** differs from that of FIGS. **1** through **8** above described primarily in the construction of modified lock units **63A** and **64A** and modified end portions **66A** of the support bar **61A.**

The lock units **63A** and **64A** are preferably mirror images of each other. Thus, except as otherwise noted, description of portions of one of the lock units will apply to corresponding portions of the other lock unit.

The lock unit **63** comprises an elongated tube **201** (FIG. **10**) snugly but slidably receivable over and preferably being curved in conformance with, the upper ring portions **32A.** A tubular boss **203** is, as shown in FIG. **11** with respect to lock unit **64A,** secured, as by welding, to the tube **201,** extending outwardly therefrom on a radius of the ring portion **32A.** The outer end of the tubular boss **203** is radially inwardly lipped and the inner end thereof opens into and is radially coextensive with a hole **205** in the tube **201.**

An elongated lock pin **207** extends axially through, and is slidably within, the tubular boss **203** and includes an enlarged and preferably tapered head **208.** The head **208** is extendable through the hole **205** in tube **201** and through an aligned one of the holes **103A** in ring portion **32A** for positively locking the corresponding lock unit **63A,** or **64A,** circumferentially on the corresponding ring portion **32A.** The opposite end of the locking pin **207** extends beyond the outer, lipped end of the tubular boss **203** and has a hand engageable pull knob **209** fixed thereto, preferably by threaded engagement

therewith. A coil compression spring **211** surrounds the central part of the lock pin **207** and bears against the head **208** and lipped outer end of the tubular boss **203,** to urge the lock pin **207** into the tube **201,** to the extent allowed by the enlarged pull knob **209** and as shown for example in FIGS. **10** and **11.** A manual pull on the knob **209** retracts the head **208** into the tubular boss **203,** allowing the tube **201** to slide circumferntially on the ring portion **32A.**

A linear cross tube **213** (FIG. **9**) extends laterally across, and is fixed as by welding, to the outer surface of the tube **201** for snugly but pivotally receiving the adjacent end **66A** of the support **61A.** The cross tube preferably extends laterally inwardly from the tube **201.** The cross tube **213** is preferably located, as seen in FIG. **10,** immediately above the tubular boss **203** and is in contact therewith to provide mutual bracing. Thus, the cross tubes **213** of lock units **63A** and **64A** will be coaxially aligned, as seen in FIG. **9,** when the lock pins **203** thereof engage corresponding holes **103A** of the left and right ring portions **32A,** and will snugly but pivotally receive the opposed ends **66A** of the support bar **61A** for supporting the latter on the rings.

Lower and upper stop bars **215** and **216,** respectively, are fixed, as by wleding, to the periphery of the cross tube **213** and extend axially inwardly therebeyond in radially overlapping relation with the exposed end portion **66A** of the support bar **61A.** As seen in FIG. **10,** the stop bars **215, 216** are circumferentially spaced from each other around the cross tube **213** and are aligned substantially at right angles to each other. In the preferred embodiment shown, the stop bars **215** and **216** do not extend radially from the cross tube **213,** but rather are circumferentially offset from parallel radii of the cross tube **213.** Both said stop bars lie, in the preferred embodiment shown, within the same quadrant of the cross tube **213.** The upper stop bar **216** lies substantially at right angles to the axis of tube **201** and the stop bar **215** is substantially parallel to such axis.

A further stop bar **218** (FIGS. **9** and **10**) is fixed to each end portion **66A** of the support bar **61A,** intermediate the extremities of said end portions, and is preferably welded thereto. With the support bar **61A** installed on the lock units **63A** and **64A,** as shown in FIG. **9,** each stop block **218** circumferentially overlaps the corresponding stop bars **215** and **216** on the adjacent lock unit. The stop bar **218,** as seen in FIG. **10,** is circumferentially offset from a radius of the support bar end portion **66A,** in a direction radially outwardly of the rings. However, the stop bar **218** preferably parallels the plane of the generally U-shaped support bar **61A** and extends generally toward the offset central portion **67A** of such support bar. A setscrew **220** (FIG. **10**) carries a locking nut **221** at its leftward end and is threadedly receivable through the stop bar **218** for axial adjustment with respect thereto. The rightward end of the screw **220** will normally extend rightwardly beyond the stop bar **218** for abutting the lower stop bar **215** on the adjacent lock unit, so as to positively determine the lower pivotal limit position of the support bar **61A.** Such lower limit position is shown in FIGS. **9** and **12** wherein the central portion **67A** of the support bar **61A** is properly located for securement to the adjacent end of the anterior frame **41A,** by mean of the threaded stud **54A** and nut **57A** as above described with respect to FIG. **5.**

The support bar **61A,** upon disengagement from the anterior frame **41A,** may be pivoted in a clockwise direction, as seen in FIG. **12,** upwardly and past the axis of cross tube **213** through an intermediate over-center position, indicated in broken lines at A—A, to a final clockwise limiting position generally indicated at B—B, the latter position being determined by abutting interference between the setscrews **220** and the upper stop bars **216** on cross tubes **213.**

However, in normal use it is preferred that the support bar **61A** be positively located in either in lower interior frame engaging position (indicated in solid lines in FIG. **12**) or in its over-center, intermediate position A (also shown in solid lines in FIG. **13**). In such over-center position, the support bar **61A** extends upwardly from the cross tubes **213** substantially tangentially, and slightly outboard, of the rings and is thus well out of the way of any activity such as installation or removal of a patient from the bed structure, repositioning of the anterior frame **31A,** which allows unobstructed access for inserting emergency airway, stomache tubes, or head traction apparatus and administration of anesthesia, etc.

To fix the support **61A** in its over-center position AA, a support bar pivot lock **225** (FIGS. **9** and **13**) is provided on either one of the lock units **63A** and **64A,** here the lock unit **63A,** it being unnecessary to provide more than one such pivot lock **225.** The pivot lock **225** comprises an internally threaded cup **227** fixed, as by welding, to the periphery of the cross tube and extending substantially upwardly therefrom in parallelism with the substantially downwardly directed stop bar **215.** A pivot lock pin **228** is radially flanged intermediate its ends for guided sliding movement axially in the cup **227.** The lower end of the pin **228** normally extends downwardly through suitable coaxial openings in the bottom of the cup **227** and in the cross tube **213** and drops automatically, by gravity, into a corresponding hole **230** in the end portion **66A** of support bar **61A** when the latter is in its overcenter position AA of FIGS. **12** and **13.** A shouldered, quill externally threaded, hollow quill telescoped over the upper end of the pivot lock pin **228** and threadedly engages the interior of the cup **227,** whereby axial motion of the pivot lock pin has spaced limits established by contact of the flanged intermediate portion thereof with the bottom of the cup **227** and the inner end of the quill **231.**

In summary, the support bar **61A** and the attached end of anterior frame **41A** may be adjusted circumferentially on the rings **32A** by a manual pull on the knobs **209** of lock units **63A** and **64A,** circumferential shifting of such lock units along the rings to a new position and release of the knobs to allow the heads **208** of pins **207** to engage the holes **103A** in the rings, thereby positively fixing the lock units **63A** and **64A** in a new position circumferentially of the rings.

To locate the support bar **61** in its upward, over-center position AA, as for allowing manipulation of the anterior frame **41A** for installing or removing a patient from the bed construction or to prevent pivotal movement of the support bar **61A** during removal or installation of the upper ring portions **32A** with respect to the lower ring portions shown, for example, at **31** in FIG. **1,** the support bar **61A** is pivoted clockwise from its solid line position of FIG. **12** toward its position AA.

Upon reaching the position AA, the pivot lock pin **228** drops by gravity into the hole **230** in the adjacent support bar end **66A** locking the support bar in its position AA.

To release the support bar from its over-center position AA, an upward pull on the pivot lock pin **228** disengages same from the support bar **61A**. The support bar **61A** can then be pivoted to its upward limiting position BB or, more normally, to its anterior frame support position shown in solid lines in FIG. **12**. To interengage the support bar **61A** with the anterior frame **41A**, as shown in FIG. **12**, the anterior frame is located above its position of FIG. **12** and the support bar **61A** is pivoted downwardly, in a counterclockwise direction, stopping when the setscrew **220** contacts the stop bar **215**. Given a suitable prior adjustment of the setscrew **220** of each lock unit, downward movement of the anterior frame **41A** drops the end portion thereof over the stud **54A** and onto the central portion **67A** of the support bar, whereafter placement of the nut **57A** completes installation of the anterior frame end on the support bar.

Although a particular preferred embodiment of the invention has been disclosed in detail for illustrative purposes, it will be recognized that variations or modifications of the disclosed apparatus, including the rearrangement of parts, lie within the scope of the present invention.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. An anterior frame end support apparatus for a hospital bed of the type having a coaxial pair of upstanding, spaced side rings rotatable on a supporting base and normally spaced, substantially diametrally extending posterior and anterior frames between said rings for supporting a patient to allow rotational orientation of the patient about an axis transverse to his body, comprising in combination:

an elongate support extending between said rings and having ends positionable adjacent corresponding ones of said rings and a central portion securable to the anterior frame adjacent one end thereof;

a lock unit slidably supported on each of said rings and connected to a corresponding one of said support ends for adjustably mounting said support on said rings;

means defining a plurality of circumferentially aligned openings circumferentially spaced along said rings;

manually actuable plunger means on each of said lock units normally engageable in said ring openings for positively locking said anterior frame support on said rings and releasable for allowing selected repositioning of said anterior frame support at a plurality of positions along said rings corresponding to the location of said openings in such rings.

2. The apparatus of claim **1** in which said lock unit includes a block having a first opening therethrough adjacent one end thereof, the axis of said opening lying substantially in the plane of the adjacent ring, said adjacent ring being slidably receivable through said first opening, means defining a second opening in said block adjacent the other end thereof and spaced from said first opening, the axis of said second opening being transverse to said plane of said adjacent ring, the adjacent end of said support being snugly but rotatably received in said second opening, means defining a third opening in said block communicating with said second opening, said plunger means comprising an elongate plunger slidably supported on said block within said third opening.

3. The apparatus of claim **2** including an elongate sleeve extending through said first opening and means fixing said sleeve to said block, the sleeve being linear and of inside diameter exceeding the thickness of said ring sufficiently as to allow snug sliding reception of said ring therein, said ring engaging each end of said sleeve at a point on the side of said sleeve facing internally of said ring, plugs fixed inside said sleeve adjacent the ends of said sleeve, said plugs being spaced on opposite sides of the plane of said ring and being located on the half of said sleeve furthest from the center of said ring, said ring slidably contacting each end of said sleeve at said point and said plugs for slidably supporting said block on said ring.

4. The apparatus of claim **2** in which said third opening extends longitudinally of said block, the axis of said third opening lying transverse to and intersecting the axes of said first and second openings, said plunger means including a casing snugly received in said third opening, said plunger being slidably received in said casing, an opening in said support end alignable with said third opening of said block and loosely receiving said casing therethrough for allowing limited pivotal movement of said support about the axis of said support end with respect to said block, said central portion of said support being radially offset from the axis of its ends and engageable with the adjacent end of said anterior frame, whereby pivotal movement of said support allows the anterior frame to be alternatively supported on said support central portion and to move therepast.

5. The apparatus of claim **4**, including spring means on said block engageable with said support ends for shifting said central portion of said support away from said rings.

6. The apparatus of claim **5**, in which said spring means comprises a leaf spring, said leaf spring having one end engaging said support end outside said block and an opposite end spaced from said support end and extending along said block, abutment means on said block engaging said other end of said spring and maintaining a bending force on said spring for resiliently and pivotally urging said support away from said rings.

7. The apparatus of claim **2**, in which said third opening extends from said other end of said block through said second opening and into said first opening, said plunger means further including a casing snugly receivable within said third opening, said third opening having a shoulder intermediate said first and second openings and facing toward said second opening, said casing being axially fixed in said third opening in contact with said shoulder, a compression spring within said casing, said plunger being slidably located within said casing and compression spring and extending axially therebeyond, an enlarged head on one end of said plunger slidably located within the reduced diameter portion of said third opening defined by said shoulder and adjacent end of said casing, a sleeve in said first opening for slidably receiving the adjacent ring therethrough, a hole in said sleeve coaxial with the third opening for receiving said head therethrough, said head being receiv-

able in a selected one of said openings in the adjacent ring when said selected opening is in alignment with said hole in said sleeve and said third opening for locking said block in fixed circumferential location on said ring.

8. The apparatus of claim **7,** including overlapping means adjacent the outer end of said casing and extending radially inwardly thereof in radially overlapping relation with said compression spring, said overlapping means guiding said plunger, said head radially overlapping said compression spring so that movement of said head into said casing is resisted by compression of said compression spring, a knob on the end of said plunger opposite said head and extending out of said third opening for manual engagement to retract said plunger head into said casing and out of contact with said spring.

9. The apparatus of claim **1** including circumferential pivot limit means on at least one of said lock units for positively limiting pivotal movement of said support on said lock unit.

10. The apparatus of claim **9,** in which said pivot limit means comprises a pivot lock pin on said one of said lock units positively engageable with an adjacent portion of said support for positively locking said support in a rest position pivotally remote from its normal position with engagement of said anterior frame.

11. The apparatus in claim **10,** including means locating said pivot lock pin for axial movement on said one lock unit and so as to extend substantially upwardly therefrom and including means limiting axial movement of said pivot lock pin, said adjacent support portion having a hole therein for receiving the inner end of said pivot lock pin when aligned therewith and in response to gravitational attraction of said pin.

12. The apparatus of claim **9,** in which said pivot limit means comprises first and second stop bars fixed to said one lock unit and spaced circumferentially with respect to the axis of the adjacent support end and a third stop bar fixed to said support end in longitudinally overlapping relation with said first and second stop bars, whereby interference between said third top bar and said first and second stop bars establishes first and second circumferentially spaced pivot limiting positions of said support.

13. The apparatus of claim **12,** including an adjustment screw on said third stop bar engageable with said first stop bar to adjustably establish one of said circumferential limiting positions wherein said support is securable to said anterior frame.

14. The apparatus of claim **1,** in which each of said lock units comprises a tube closely conformed to and slidably surrounding a corresponding one of said rings, a cross tube affixed to said tube and extending transversely thereof for telescopically receiving therein the adjacent end of said support, a tubular boss extending from said tube adjacent said cross tube in substantially transverse relation to said tube and cross tube, said plunger means being carried by said tubular boss.

15. The apparatus of claim **14,** including a stop bar on said support engageable with an opposed end of said cross tube for limiting the extent of penetration of said support end in said cross tube.

16. The apparatus of claim **14,** including coacting stop bars on said cross tube and the adjacent portion of said support for interacting to define positive limits to pivotal movement of said support with respect to said lock unit, means for adjusting at least one of said limits and gravitationally actuated limit means responsive to assumption of an intermediate pivotal position of said support with respect to one of said lock units for positively preventing pivotal movement of said support out of such intermediate position.

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