United States Patent [19]

Paine

[11] **3,919,727**

[45] **Nov. 18, 1975**

[54] **HIDDEN ADJUSTMENT MEANS FOR A BED**

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[52] **U.S. Cl.** **5/63;** 5/66

[51] **Int. Cl.**[2] **A61G 07/10**

[58] **Field of Search** 5/63, 66–68

[56] **References Cited**

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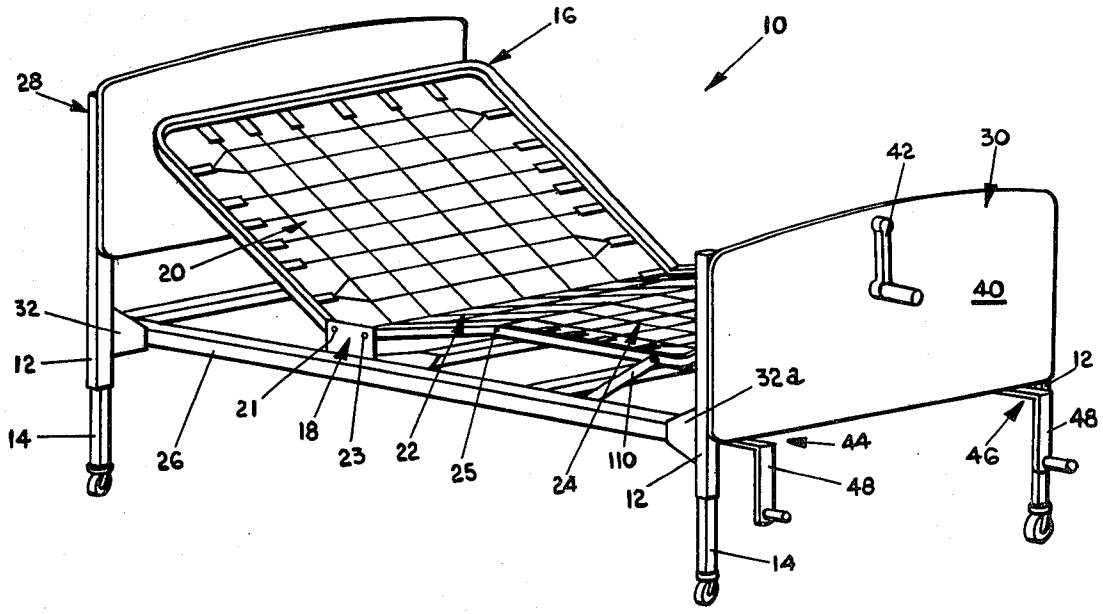
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Attorney, Agent, or Firm—Price, Heneveld, Huizenga & Cooper

[57] **ABSTRACT**

A bed with adjustable articulated spring surfaces utilizes actuator assemblies concealed in the bed frame and which are connected to movable sections of the articulated surfaces to provide adjustment thereof. The spring surfaces are also vertically adjustable through bed frame corner support brackets that mask a cable and pulley assembly which raises and lowers the bed frame.

15 Claims, 11 Drawing Figures



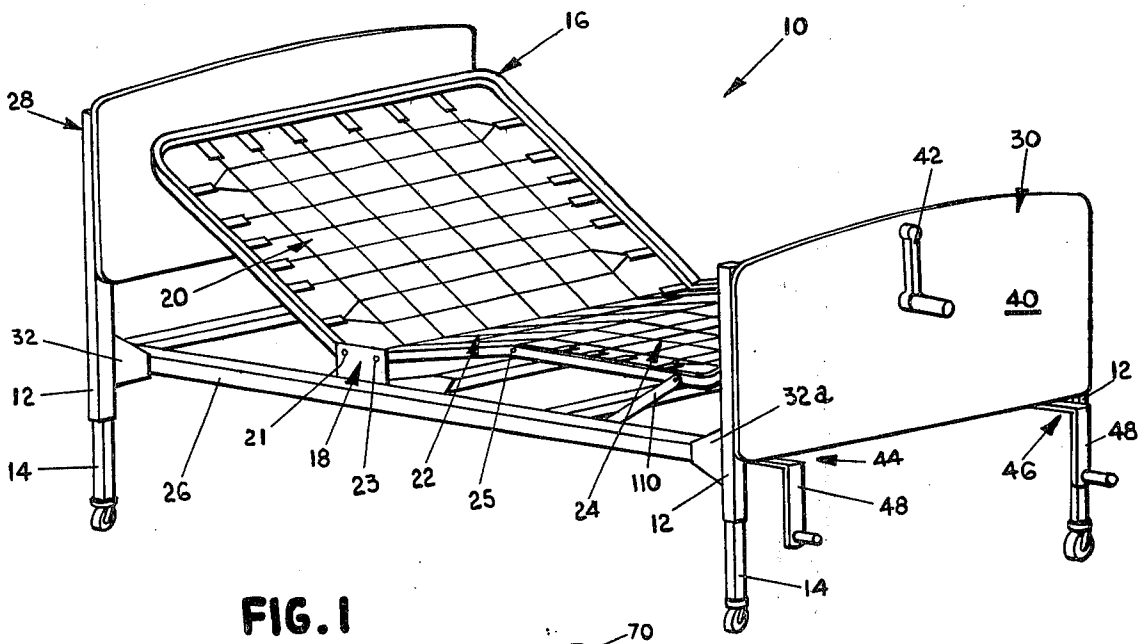


FIG. 1

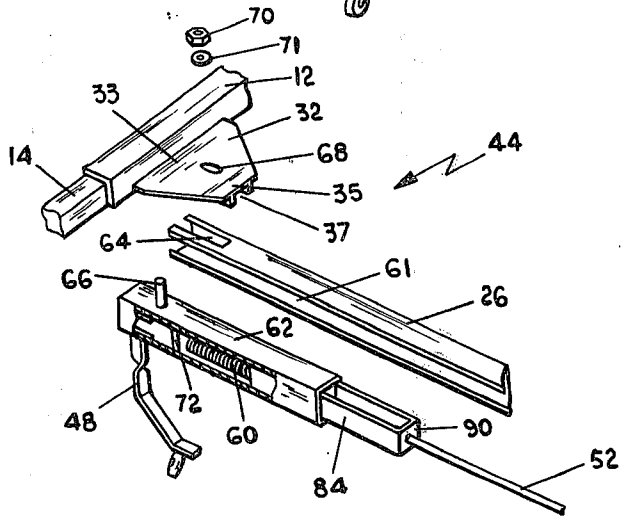


FIG. 4

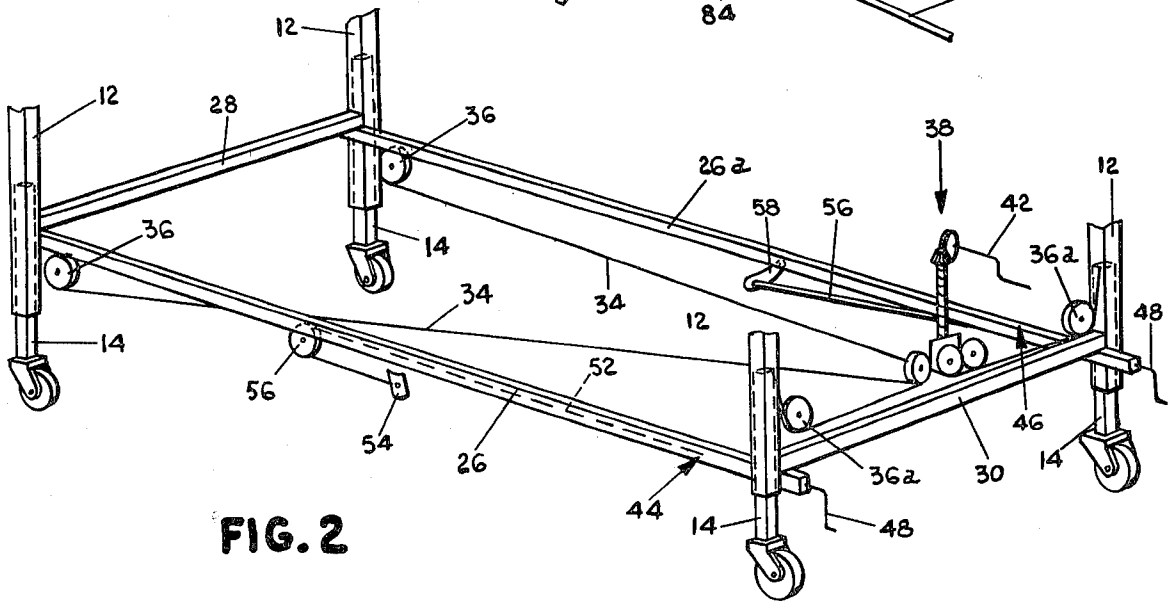


FIG. 2

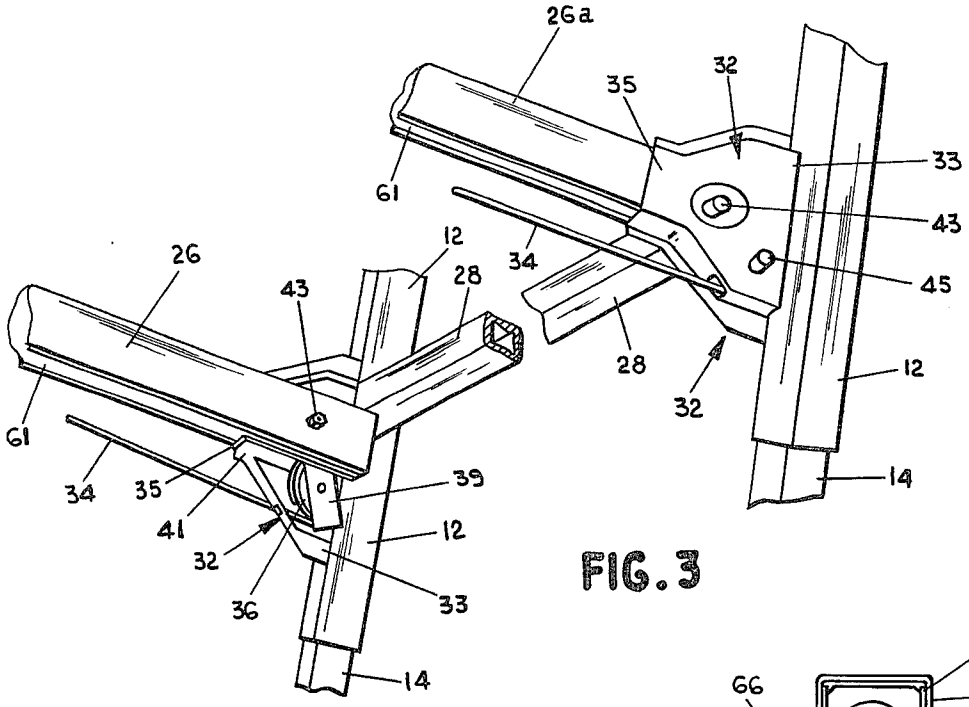


FIG. 3

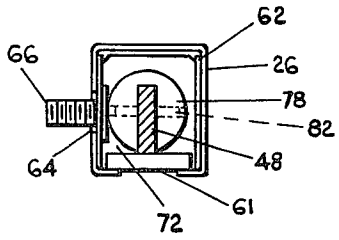


FIG. 11

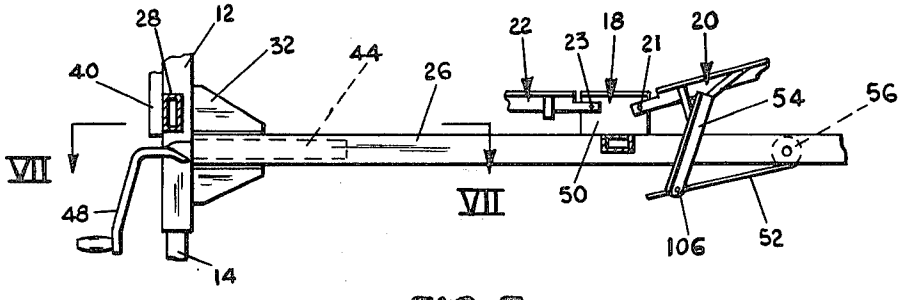


FIG. 5

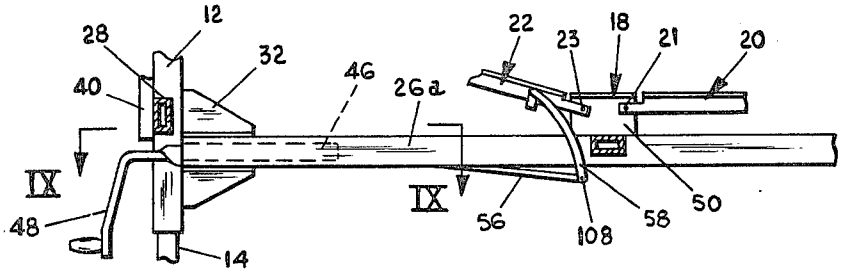


FIG. 6

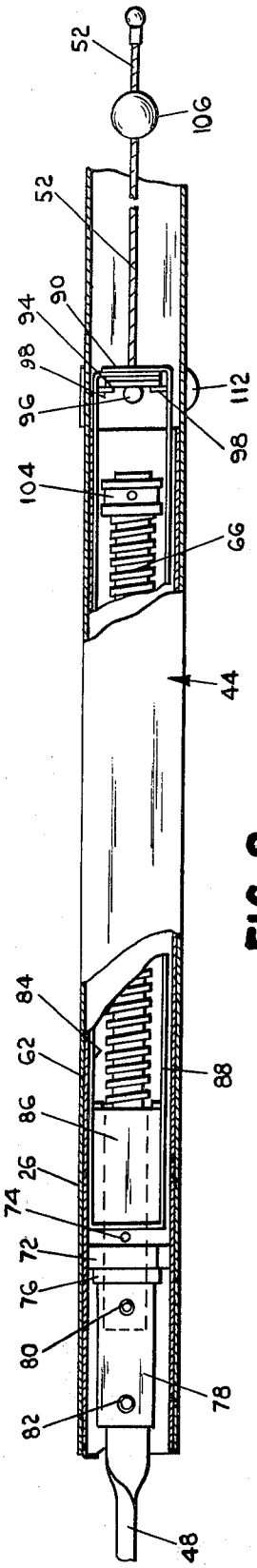


FIG. 8

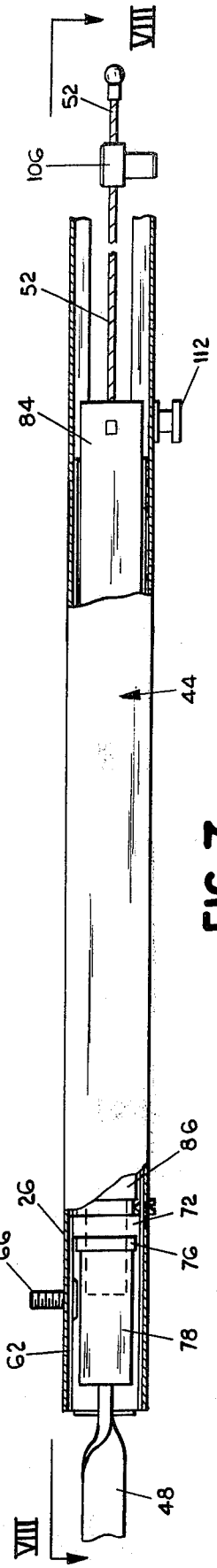


FIG. 7

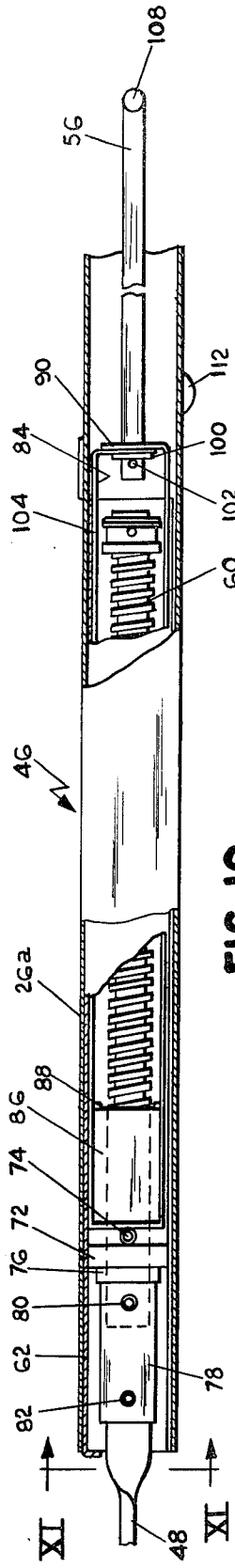


FIG. 10

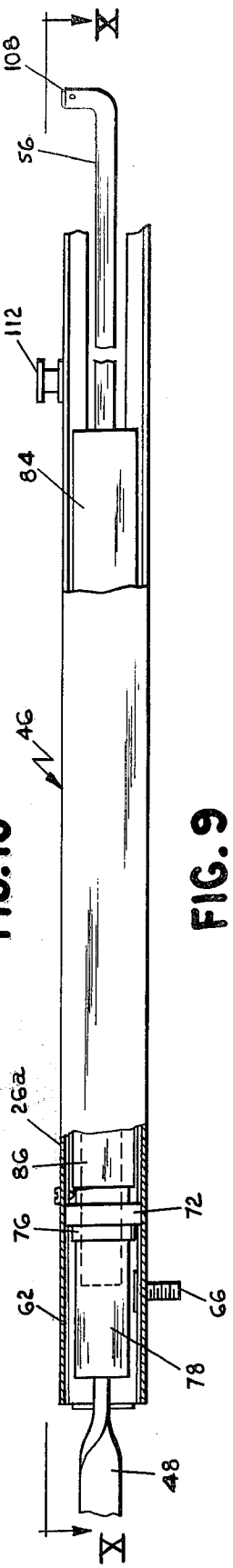


FIG. 9

HIDDEN ADJUSTMENT MEANS FOR A BED

BACKGROUND OF THE INVENTION

The present invention relates to hospital beds and the like and in particular to such beds having an articulated spring surface and means for adjusting the same to various positions.

Various means for adjusting bedsprings in beds have been developed. Many of these adjustment means involve complicated assemblies that are clamped onto the frame of the bed. Such assemblies act to vertically raise and lower the bed with respect to the floor and also to articulate sections of the spring surface with respect to one another.

Since attachment of the adjustment means to the bed frame detracts from the appearance of the bed and also decreases the amount of unobstructed area around the bed, it is desirable to combine the bed adjustment structure with the already existing support structure of the bed.

Some prior art beds have attempted to place the adjustment components in the frame structure itself, but only have been able to do so by using relatively complex adjustment means. In particular, the adjustment means for articulating the spring surface have been complex and not readily suited for placement in the spring frame. Also, difficulties have resulted when attaching the spring frame to the bed legs so as to allow ready vertical movement of the bedsprings up and down along the bed support legs.

SUMMARY OF THE INVENTION

Accordingly, it is an object of the present invention to provide a bed frame with an adjustment means for the spring surface which is relatively simple in operation and easily constructed.

It is a further object of the present invention to provide adjustment means of the type described which are highly compatible with conventional bed frames and easily integrated therewith and hidden therein.

It is an even further object of the present invention to provide a corner bracket which attaches the spring frame to the bed legs and conceals the cable means which allows ready vertical movement of the spring surface with respect thereto.

These and other objects are accomplished in the present invention by a bed with a spring surface having at least one movable spring section with adjustment means for the spring surface concealed in the frame and further optionally including corner support brackets integrated with bed frame leg members and which conceal a means for vertical adjustment of the spring surface.

Preferably, the spring surface includes an intermediate or seat section rigidly secured to the bed frame, a head section pivotally connected to the knee section, a knee section pivotally connected to the seat section and a foot section pivotally connected to the knee section. A pair of actuator assemblies mounted in the side frame elements are accessible for operation at the foot end of the bed. Each of the actuator assemblies preferably includes an integral stud thereon which provides a means for securing the actuator within the bed frame element and for securing the frame element to a corner bracket affixed to the bed leg.

In the preferred embodiment, the bed is vertically adjustable by means of a cable assembly that extends through the bed frame support structure to operate telescoping bed legs adjustably attached to the bed frame. The cables extend through corner support brackets at the head end of the bed and around a pulley concealed therein and into internal telescoping elements of the bed legs.

When it is desired to move the head or knee sections of the articulated spring, the appropriate actuator assembly is used to move the respective head or knee section of the bed frame attached thereto into the desired position. When it is desired to vertically adjust the bed frame, cables running through the bed frame support structure are either extended to lower the bed frame or tightened to raise the bed frame on the internal telescoping member of the bed leg.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a perspective view of an adjustable bed incorporating the present invention;

FIG. **2** is a schematic illustration of the bed of FIG. **1** showing the adjustment means for the articulated spring surfaces and the adjustment means for vertical movement of the bed frame;

FIG. **3** is a fragmentary perspective view of a typical corner support bracket at the head end of the bed frame;

FIG. **4** is an exploded fragmentary perspective view of the actuator assembly, side frame, and corner support bracket positioned at the foot end of the bed;

FIG. **5** is a fragmentary side elevational view of the bed showing the adjustment means for the head section of the spring surface;

FIG. **6** is a fragmentary side elevational view of the bed showing the adjustment means for the knee and foot section of the spring surface;

FIG. **7** is an enlarged fragmentary elevational view of the bed frame and actuator assembly for the head section as viewed along plane VII—VII of FIG. **5** with details omitted for clarity;

FIG. **8** is a side view taken along the plane VIII—VIII of FIG. **7** with portions of the structure broken away for clarity;

FIG. **9** is an enlarged fragmentary elevational view similar to FIG. **7** as viewed along the plane IX—IX of FIG. **6;**

FIG. **10** is a view similar to FIG. **8** taken along the plane X—X of FIG. **9;** and

FIG. **11** is an end view of a typical actuator assembly as viewed along the plane XI—XI of FIG. **10.**

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawings and in particular to FIG. **1,** an adjustable bed embodying the features of the invention is illustrated as comprising a main framework indicated generally by the reference numeral **10.** The frame is supported at each end in a well-known manner by means of leg members **12** secured to the framework and telescopically engaging inner floor supported legs **14.** The main frame supports a normally horizontally disposed articulated spring surface **16** which comprises an intermediate or seat section **18** rigidly secured to the frame, a head section **20** pivotally connected to the intermediate section at **21,** a knee section **22** pivoted to the rigid seat section **18** at **23** and a foot section **24** pivotally connected at **25** to the knee section **22.** The

spring support framework to which seat section **18** is secured includes side rails **26,** a transversely extending head frame assembly **28** and a foot frame assembly **30** which are interconnected by means of corner brackets **32-32a** fixed on legs **12** and to the side rails **26** to form an integral assembly.

Corner brackets **32–32***a* serve a dual purpose. Corner brackets **32–32***a* attached to leg members **12** at the head and foot frame assemblies **28** and **30,** respectively, provide both a convenient mounting means for the side rails with respect to the head frame **28** and the foot frame **30.** Corner bracket **32** at the head end of the bed also serves to conceal a cable **34** and a pulley **36** positioned in brackets **32** operably interconnecting the cable **36** to the telescopic legs **14** at the head end of the bed. A typical cable and pulley assembly at the head of the bed is shown in FIG. **3** wherein connecting cable **34** passing over a pulley wheel **36** extends into leg member **12** where it is attached to the upper portion of telescopic legs **14.** With reference to FIG. **2,** the operative elements of the cable and pulley assembly are of fairly conventional construction and may be of the type as disclosed for example in commonly assigned U.S. Pat. No. 3,281,872, issued Nov. 1, 1966 to Ronald D. Dewey entitled HOSPITAL BED and incorporated herein by reference.

The main frame is vertically adjusted by means of cables **34** and pulleys **36–36***a* mounted and concealed at the head and foot ends of the bed by means of a gear and pulley assembly **38** mounted on the base or footboard **40** in a convenient manner. Each cable **34** is operably connected to gear and pulley assembly **38** and extends via pulleys **36** in corner brackets **32** at the head frame assembly **28** into legs **12** where the cables **34** are connected to the top portion of telescoping legs **14.** Pulleys **36a** are concealed with the foot frame assembly in a manner similar to that disclosed in the above identified U.S. Pat. No. 3,281,872. As crank arm **42** (FIGS. **1** and **2**) is rotated, cables **34** are either extended or retracted lowering or raising legs **12** over the telescopic legs **14** causing the bed frame to raise or lower as required. As will be apparent in the drawings, each corner bracket **32** and the footboard **40** act to mask the gear and pulley assembly **38,** cables **34** and pulleys **36–36***a* from view, so that the bed assembly resembles a conventional bed.

Movement of various sections of the articulated spring surface **16** is accomplished by means of a pair of actuating elements **44** and **46** positioned in side rails **26** on each side of the main frame **10** and accessible at the footboard end of the bed. Actuators **44** and **46** are essentially identical in construction and are operated by folding crank arms **48** extending from the footboard end of the bed. Referring to FIGS. **5** and **6,** the articulated spring surface is mounted on frame **10** by means of side frame support brackets **50** which rigidly support and form the intermediate section **18** between head and knee sections **20** and **22,** respectively. Support brackets **50** are rigidly attached to side frame members **26** in a conventional manner. Head section **20** is operably connected by means of a cable **52** (FIGS. **2** and **5**) connected to a link arm **54** at one end and passing over a pulley **56** where the opposite end of the cable is connected to actuator **44** concealed in side rail **26.** Link arm **54** is rigidly fixed to head section **20** for movement therewith and operation by actuator **44** as will be hereinafter described.

Actuator **46** is similarly concealed in the opposite side rail **26a** and is operatively connected to operate the knee and foot portions of the articulated spring surface by means of a rigid connecting rod **56** and a rigid linking arm **58** connected to knee section **22** proximate its pivotal connection **23** with intermediate section **18.**

Referring briefly to FIGS. **3** and **4,** side rails **26** are generally U-shaped in configuration and when positioned to form the main frame **10** are oriented such that the opening **61** to the inner portion of the channel faces downwardly.

Corner brackets **32–32***a*, as previously discussed are utilized to rigidly secure side rails **26** to the head and foot frame assemblies **28** and **30** in rigid spaced relationship. Corner brackets **32–32***a* are similar in construction and are each fixed as by welding to leg members **12.** Corner bracket **32** fixed on head frame assembly **28** serves to conceal the previously mentioned pulley **36** and cable **34** passing thereover. Corner bracket **32***a* at the foot frame assembly **30** receives and secures rails **26–26***a* and actuators **44** and **46** as will be discussed hereinafter. Similar reference numerals are therefore utilized in the following description to delineate similar features thereof with additional reference to FIG. **4.** Referring to FIG. **3,** the corner brackets at head frame **28** are relatively thin in cross section and somewhat triangular in shape. The base **33** is welded to leg **12** and the top or apex **35** of the bracket extends outwardly from the leg. A channel portion **37** is formed by a pair of parallel flange like walls **41** extending generally perpendicular to leg **12** from base **33** to apex **35.** An opening **68** extends laterally through the side of the bracket opening through the back wall of channel **37.** An arm **39** on bracket **32** at the head frame assembly extends downwardly from the lower wall of channel **37** to support pulley **36** over which cable **34** is passed to the adjustable legs.

An elongated slot **64** is formed along one side of rail **26** and is adapted to receive a stud member **66** which extends outwardly from one side of the actuator outer housing **62.** As the outer housing **62** of the actuator and the components supported therein are positioned within rail **26** stud **66** extends through slot **64.** As the frame is assembled, rails **26** are positioned in channel **37** formed in corner brackets **32***a*. At the foot end of the bed stud **66** is positioned through opening **68** in corner bracket **32***a* associated with foot section **24** where suitable fastening means as a nut **70** and lock washer **71** secure rails **26** to the corner brackets and the actuator within the rail. The opposite end of rails **26** is secured to corner brackets **32** associated with head frame **28** by similarly positioning the rail end in channel **37** and securing in a conventional manner as by suitable nut and bolt fastening means **43.** Similar fastening means as a bolt **45** passing through the side rail of corner bracket **32** and arm **39** forms a shaft upon which pulley **36** is rotatably mounted.

Referring additionally to FIGS. **7–11,** the construction and operation of the actuator assemblies **44** and **46** will be described in detail. The actuators are essentially identical in construction and in operation and are concealed within side rails **26** and **26***a*. The actuator assemblies include an elongated lead screw **60** to which crank arms **48** are attached to effect relative rotation thereof. Lead screw **60** is fixed for rotation by crank arm **48** within an elongated fixed or outer housing member **62.** The outer housing is generally rectangular

in cross-sectional configuration and is adapted to fit into the foot end of side rails **26.**

The outer housing **62** is the relatively fixed portion of the actuator assembly and includes a trunnion collar **72** fixed in the inner housing. The trunnion collar serves as a support means for the lead screw. A locking pin **74** extends transversely through the lead screw at one side of the trunnion collar while a bearing **76** positioned around the lead screw abuts the opposite side of the trunnion collar to fix the lead screw in place. Bearing **76** is retained on lead screw **60** by an elongated crank collar **78** secured to the lead screw by a locking pin **80** extending transversely through aligned openings in the crank collar and the lead screw. Collar **78** is adapted to receive one end of crank arm **48** and is slotted in a conventional manner to cooperate with an elongated slot (not shown) provided in the end of crank arm **48** to slide and pivot about a pin **82** to pivot downwardly for storage when not in use.

A follower member **84** is mounted for movement along the axial length of lead screw **60** within outer housing **62** in response to turning of crank **48** (and lead screw **30**). The follower member is mounted for sliding movement along the length of lead screw **60** within outer housing **62.** The follower member is generally channel-shaped corresponding closely to the inner surfaces of the outer housing member **30.** An elongated threaded block **86** is fixed at one end of the follower to move along lead screw with turning thereof to urge the follower **84** axially along the length of the rail. Preferably, the threaded block **86** is molded of a lubricious material as for example nylon and is fixed with the follower member **84** in a convenient manner as by tabs **88** bent inwardly from the side walls of the follower member.

The opposite end of the follower is formed with a wall **90** to which the cable assembly **52** (FIGS. **7** and **8**) or the rigid connecting rod **56** (FIGS. **9** and **10**) are connected. As illustrated in FIGS. **7** and **8,** the cable assembly is secured at one end by a clip **94** engaging a ferrule **96** fixed at the end of the cable to abut wall **90.** Tabs **98** formed inwardly and toward wall **90** engage and hold clip **94** in position.

Referring to FIGS. **9** and **10,** connecting rod **56** which operates the combined knee and foot sections **22** and **24,** respectively, of the articulated spring surface is secured to the follower member **84** at end wall **90** by means of a washer **100** and a pin **102** extending transversely through connecting rod **56.**

The outermost end of lead screw **60** (the end opposite crank arm **48**) is equipped with a stop collar **104** fixed to screw **60** to prevent inadvertent disconnection of follower **84** from screw **60** when in its extended position.

The opposite end of cable **62** is equipped with a suitable fitting **106** which is secured to the linking arm **54** associated with head section **20** of the articulated spring surface (FIG. **5**). The outermost end of rod **56** has a turned end portion **108** by which the rod **56** is pivotally secured to linking arm **58** associated with the knee section **22** of the articulated spring surface **60** (FIG. **6**). As will be appreciated, as knee section **22** is raised, the end of foot section **24** which is pivoted at **25** to the knee section will also be raised since the end of foot section **24** is supported by pivot arms **110** (FIG. **1**) which are adjustably connected to stud members **112** extending inwardly from the side wall of the side rails **26.**

OPERATION

When it is desired to vertically raise or lower the bed and its supporting framework, crank arm **42** is operated. Gear and pulley assembly **48** acting in conjunction with cables **34** causes a relative movement between leg sections **12** and **14** to thereby raise or lower the framework.

When it is desired to move head section **20** of the articulated spring surface **16,** actuator **44** is operated by turning handle **48.** Rotation of handle **48** causes a corresponding rotation of lead screw **60** contained within actuator **44** causing follower member **84** to move therealong thereby either shortening or lengthening cable **52** passing over pulley **56** which in turn moves rigid arm **54** to raise or lower the head section. Similarly, rotation of the handle **48** associated with actuator **46** causing the follower **84** to extend or retract along the length of the actuator moves rod **56** causing a corresponding movement in linking arm **58** connected to knee section **22.** As knee section **22** moves up or down depending on the rotation of handle **48,** the end of foot section **24** hinged thereto will also be raised and follow therealong by pivoting at **25** as previously described.

As will be appreciated by those skilled in the art, all of the above adjustment assemblies are concealed in the frame structure of the hospital bed so as to provide a compact and uncluttered appearance. Each side frame **26** is secured to corner brackets **32–32***a* and each side rail houses an actuator assembly. When the corner brackets are secured to the side frames with the actuators secured therein a stable integral adjustable bed frame structure is formed which resembles a conventional bed.

Those skilled in the art will of course readily appreciate the many advantages of the present invention over that shown in the prior art. Those so skilled will also recognize that many modifications may be made and it is intended that the equivalent arrangements be covered unless the following claims by their wording expressly state otherwise.

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

1. In an adjustable bed having a supportive framework including a pair of generally parallel horizontal rail members; head and foot members having legs for supporting said rail members; an articulated surface having at least one adjustable section supported on said rail members; and actuating means for pivotally moving said adjustable section relative to said rail members; the improvement comprising: at least one of said rail members forming a channel extending along the length of the bed; said actuating means including a first member positioned in said channel and a second member also positioned in said channel and engaging and being extendible and retractable with respect to said first member along at least a portion of the length of said channel, means for extending and retracting said second member within said channel with respect to said first member; and connecting means extending through at least a portion of said channel for connecting said second member to said adjustable section to pivot said section with respect to said rail members.

2. The adjustable bed of claim **1** wherein said actuating means includes a lead screw fixed for rotation with respect to said first member; means for rotating said lead screw; and means connecting said second member

to said lead screw for axial movement along said lead screw with rotation thereof.

3. The apparatus of claim 2 wherein said adjustable section of said articulated surface is pivotally mounted to said rail members for movement with respect thereto proximate said head member and further including a linking arm fixed on said adjustable section adapted for connection to said connecting means; said connecting means including a flexible cable member connected to said second member of said actuating means and extending along said channel, said cable member being connected to said linking arm whereby movement of said second member with respect to said first member along said lead screw exerts a force on said linking arm urging said adjustable section to pivot with respect to said rail members.

4. The apparatus of claim 3 wherein said actuating means is positioned in said rail member adjacent said foot member and further including pulley means concealed in said rail member intermediate said linking arm and said head member, and wherein said cable means extends along said channel toward said head member, passing around said pulley for connection to said linking arm whereby rotation of said lead screw retracting said second member urges said adjustable section to pivot upwardly at said head member.

5. The apparatus of claim 2 wherein said adjustable section of said articulated surface is pivotally mounted to said rail members for movement with respect thereto proximate said foot member and further including a linking arm on said adjustable section adapted for connection to said connecting means; said connecting means including a rigid member having one end connected to said second member of said actuating means; the other end of said rigid member extending outwardly from said channel and pivotally connected to said linking arm on said adjustable section whereby movement of said second member with respect to said outer frame along said lead screw exerts a force on said linking arm urging said adjustable section to pivot with respect to said rail members.

6. The bed of claim 1 and further including means for vertically adjusting said bed, said adjusting means including said legs having vertically movable portions thereon; cable means having one end connected to said movable portions; a means positioned at one end of said bed connected to the other end of said cable means for operating said cable means to extend and retract said movable portions; means for guiding said cable means, said guide means including bracket members securing said rail members to at least one of said head and foot members, and pulley means concealed in said bracket members, said cable means passing over said pulley means and into operative engagement with said movable portion, said bracket members concealing said pulley and cable means from view.

7. In an adjustable bed having a framework including a pair of generally parallel horizontal rail members; head and foot members having legs for supporting said rail members; an articulated surface having a seat support section fixed to said rail members; adjustable head and foot support sections pivotally connected to said seat support and said rails; and actuating means for moving said adjustable head and foot support sections relative to said rail members; the improvement comprising: said rail members each having a channel formed therein extending along the length of the bed; actuator means concealed in said channels in each of said rails; each of said actuator means including a first member positioned in one of said channels and a second member also positioned within said channel and engaging and being extendible and retractable with respect to said first member along at least a portion of the length of said respective channel; means for extending and retracting each of said second members with respect to said respective first members within said channels; and separate connecting means for engaging each of said second members, each of said connecting means extending at least partially through one of said channels; one of said connecting means which engages one of said second members being operatively connected to said head support section and the other of said connecting means which engages the other of said second members being connected to said foot support section.

8. The adjustable bed of claim 7 wherein each of said actuating means includes a lead screw rotatably fixed for rotation with respect to said first member; means for rotating said lead screw; and means connecting said second member to said lead screw for axial movement along said lead screw with rotation thereof.

9. The apparatus of claim 8 and further including a linking arm on said head support section, said one connecting means including flexible means extending along and within said channel and connecting said one second member with said linking arm whereby movement of said one second member with respect to its respective first member along said lead screw with said means for extending and retracting said second member exerts a force on said linking arm urging said head section to pivot about said seat support section with respect to said rail members.

10. The apparatus of claim 8 wherein said other connecting means includes a rigid member having one end connected to said other second member and having its other end extending outwardly from said channel and pivotally connected to said foot section.

11. The apparatus of claim 9 wherein at least said actuator means including said one second member is positioned in one of said channels adjacent said foot member and further includes pulley means concealed in said rail member intermediate said linking arm and said head member; said flexible cable means extending along said channel toward said head member and passing around said pulley for connection to said linking arm whereby retraction of said one second member of said one actuator means urges said head support section to pivot about said seat support section and upwardly adjacent said head member.

12. The bed of claim 7 and further including means for vertically adjusting said bed, said adjusting means including said legs having vertically movable portions thereon; cable means having one end connected to said movable portions; a means positioned at one end of said bed connected to the other end of said cable means for operating said cable means to extend and retract said movable portions; means for guiding said cable means, said guide means including bracket members securing said rail members to at least one of said head and foot members and pulley means concealed in said bracket members; said cable means passing over said pulley means and into operative engagement with said movable portion, said bracket members concealing said pulley and cable means from view.

13. The adjustable bed of claim 2 wherein said first member includes an elongated housing secured within said channel and having a pair of opposing open ends;

collar means within said housing for rotatably supporting said lead screw in a fixed position within said housing; said means for rotating said lead screw including a crank handle secured to one end of said lead screw and extending from one end of said channel through one of said open ends of said housing; said second member including a channel member having two ends and means for attaching said connecting means to one of said ends, said channel member being telescoped within the other of said ends of said housing; said means connecting said second member and lead screw including a threaded block secured within said channel member adjacent the other of said two channel member ends and receiving said lead screw whereby rotation of said lead screw moves said threaded block, channel member and connecting means axially in said channel with respect to said lead screw.

14. The adjustable bed of claim **8** wherein said first member of each actuator means includes an elongated housing secured within said channel and having a pair of opposing open ends; collar means within said housing for rotatably supporting said lead screw in a fixed position within said housing; said means for rotating said lead screw including a crank handle secured to one end of said lead screw and extending from one end of said channel through one of said open ends of said housing; said second member of each actuator means including a channel member having two ends and means for attaching said connecting means to one of said ends, said channel member being telescoped within the other of said ends of said housing; said means connecting said second member and lead screw including a threaded block secured within said channel member adjacent the other of said two channel member ends and receiving said lead screw whereby rotation of said lead screw moves said threaded block, channel member and connecting means axially in said channel with respect to said lead screw.

15. The adjustable bed of claim **11** wherein said actuator means including said other second member is positioned in the other of said channels adjacent said foot member; said other connecting means including a rigid member having one end connected to said other second member and having its other end extending outwardly from said other channel and pivotally connected to said foot section.

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