United States Patent [19]

Bouman

[11] **3,877,088**

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[54] **HOSPITAL BED**

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

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

[58] **Field of Search** 5/60, 66, 67, 68, 69

[56] **References Cited**

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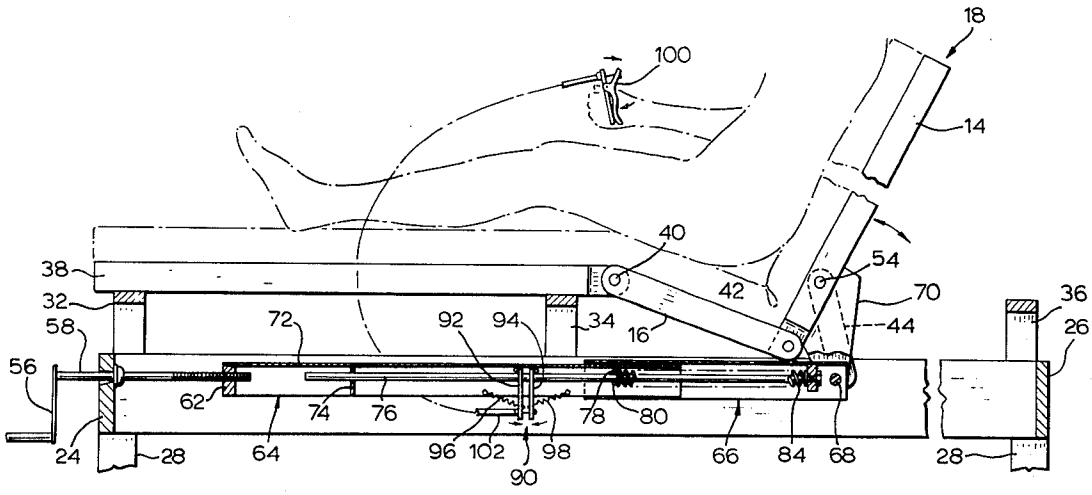
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Assistant Examiner—Kenneth J. Dorner
Attorney, Agent, or Firm—Rogers, Bereskin & Parr

[57] **ABSTRACT**

A hospital bed having an adjustable head section which is preferably combined with an adjustable seat section. A head gatch mechanism couples the head section to the bed frame and can be operated to move the head and seat sections from a horizontal position into a position in which the seat section is inclined downwardly towards the head section which is inclined upwardly. The mechanism is adjustable for patient weight so that the head section can be made to follow patient movement between supine and sitting positions.

5 Claims, 6 Drawing Figures



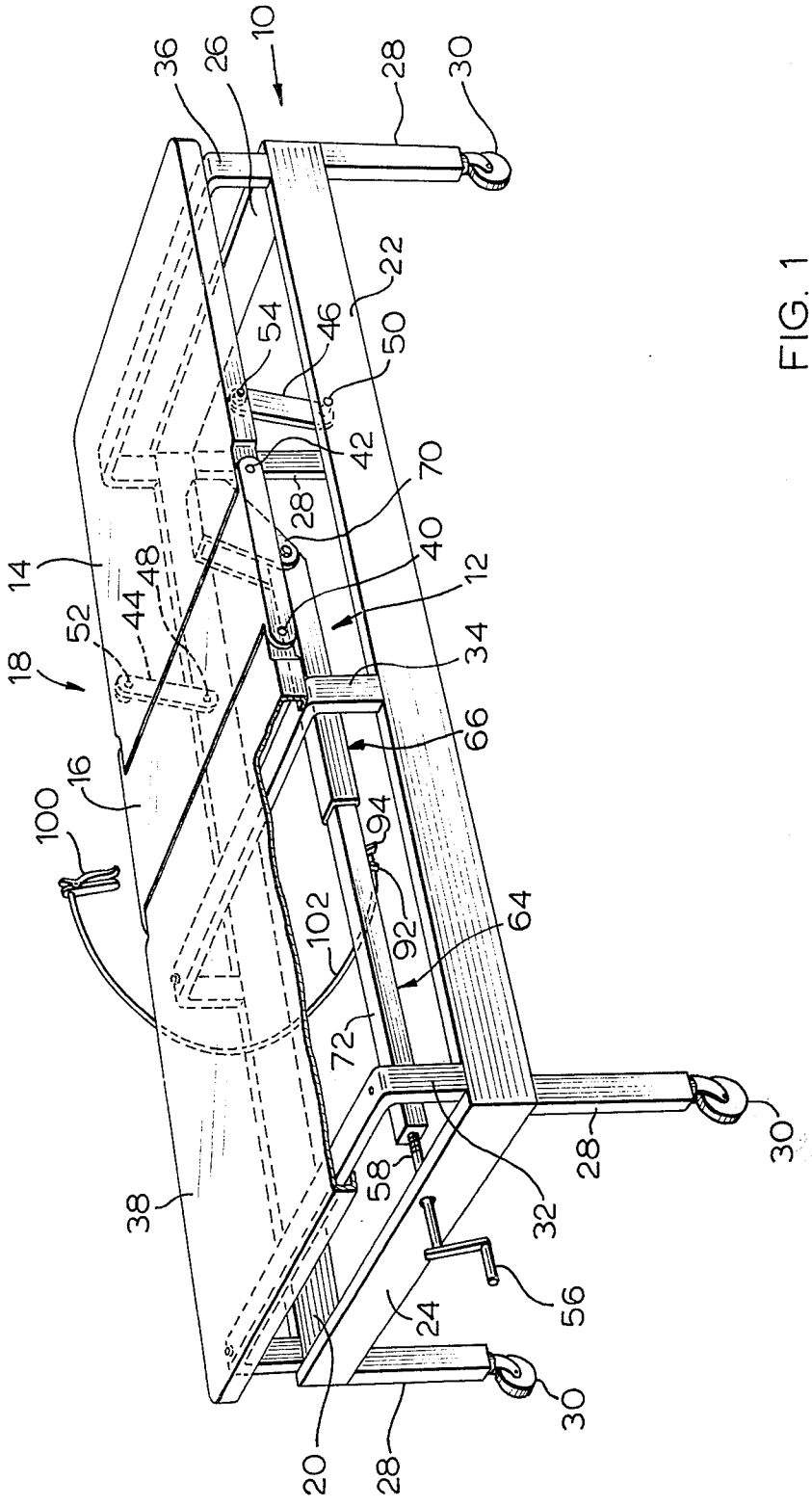

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FIG. 1

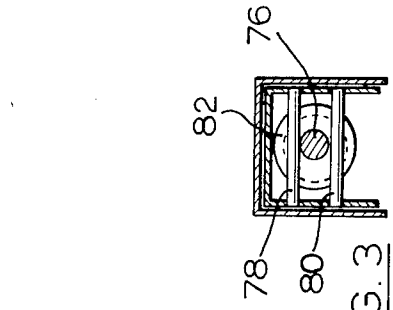


FIG. 3

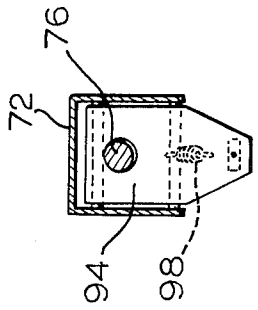


FIG. 4

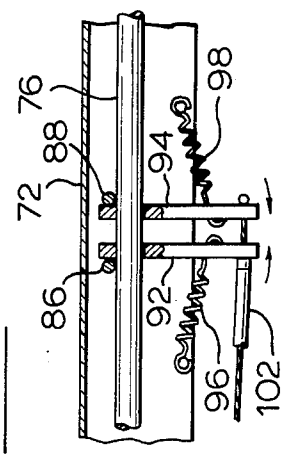


FIG. 5

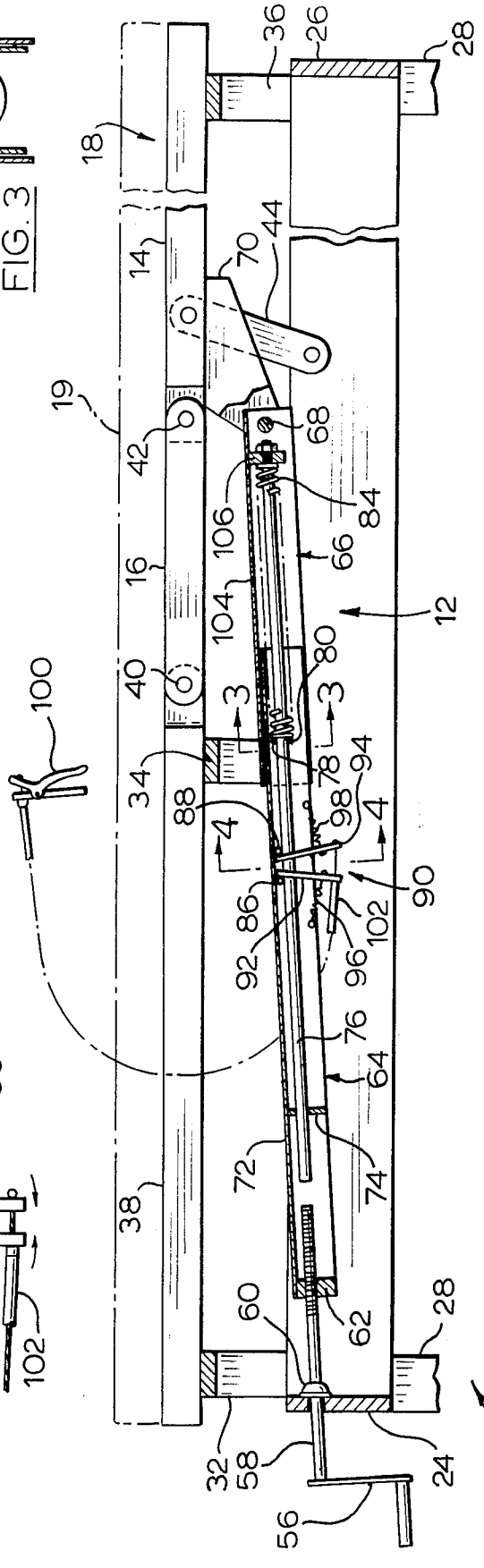


FIG. 2

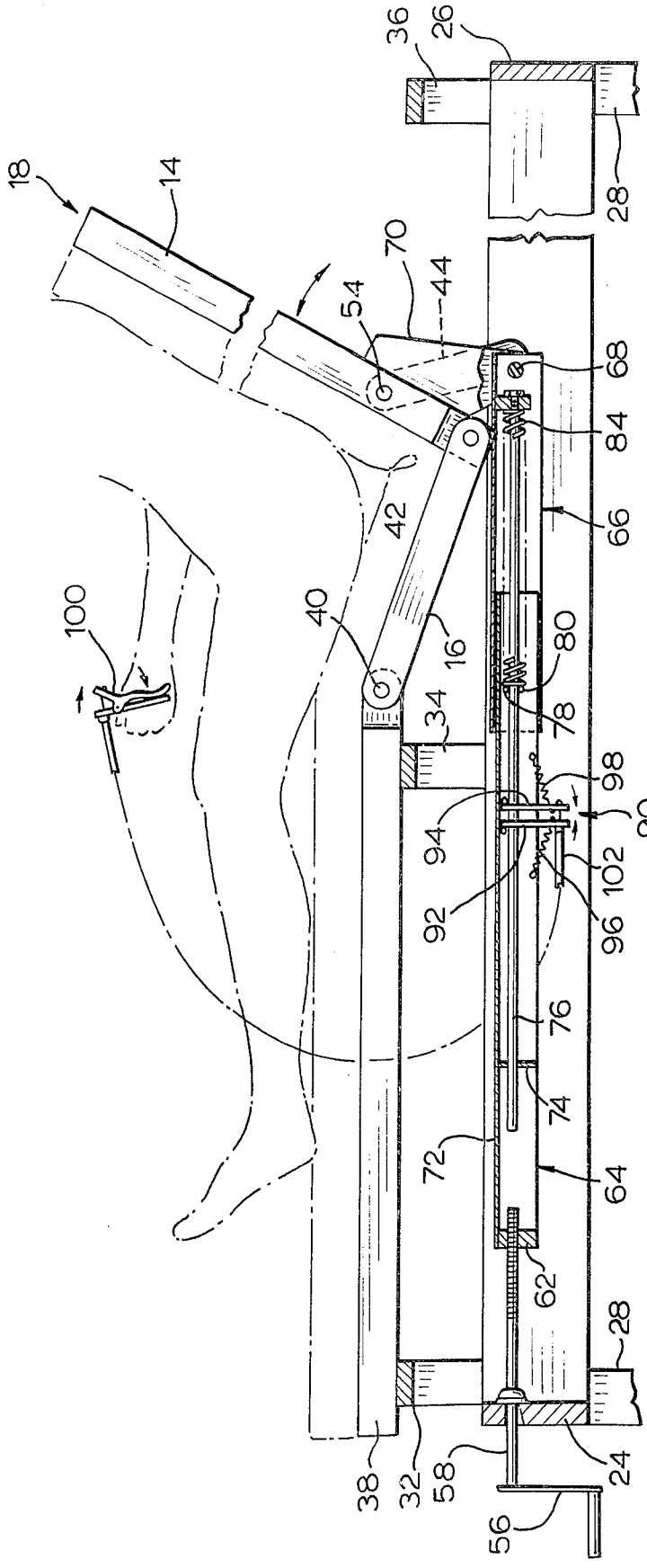

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FIG. 6

HOSPITAL BED

This invention relates to hospital beds, and more particularly to a hospital bed having a head section which can be moved between lowered and raised positions by a patient moving himself between respective supine and sitting positions.

Hospital beds are commonly provided with various adjustments which are considered necessary both from a medical standpoint and also from the standpoint of patient comfort. One of these adjustments commonly permits a head section to be moved between a horizontal or lowered position and an inclined or raised position. An improvement on this adjustment is to also provide a seat section which is coupled to the head section and which becomes inclined downwardly towards the head section as the head section is inclined upwardly. Consequently, in a sitting position, the seat section tends to better locate the patient against sliding movement down the bed and is therefore more comfortable for the patient.

The head section is commonly elevated by a manual actuator located at the foot of the bed and operated by a nurse when the patient wishes to change his position. Consequently, the patient must first call a nurse before such a bed can be adjusted. An alternative arrangement is to provide an electrical control which the patient can operate himself. Although such controls are used with success, they nevertheless suffer from the disadvantages both that they are relatively expensive and that they must include safety controls which are designed to make it difficult for a patient to injure himself by accidental misuse of the electrical control.

It is an object of the present invention to provide a head section which will move between a lowered or horizontal position and a raised or inclined position as a patient moves himself between the supine and sitting positions.

It is a further object of the invention to provide a combination head section and seat section which move to support a patient as the patient moves between a supine position and a sitting position.

Accordingly, in one of its aspects, the present invention provides a hospital bed having an adjustable head section on a bed frame. A head gatch mechanism couples the head section to the bed frame and can be operated to raise and lower the head section. The mechanism is adjustable for patient weight so that the head section can be made to follow patient movement between supine and sitting positions.

In another of its aspects the present invention provides a hospital bed having adjustable head and seat sections pivotally connected to one another and coupled to a bed frame. A head gatch mechanism couples the head section to the bed frame and can be operated to move the head and seat sections from a horizontal position into a position in which the seat section is inclined downwardly towards the head section which is inclined upwardly. The mechanism is adjustable for patient weight so that the head section can be made to follow patient movement between supine and sitting positions.

These and other aspects of the invention will be better understood with reference to the drawings, in which:

FIG. 1 is a perspective view of a bed incorporating the invention;

FIG. 2 is a side view of the bed with parts in section to illustrate hidden detail and including a double-acting locking mechanism in a locked position;

FIG. 3 is a sectional view on line 3—3 of FIG. 2;

FIG. 4 is a sectional view on line 4—4 of FIG. 2;

FIG. 5 is a sectional side view of the double-acting locking mechanism in a released position; and

FIG. 6 is a view similar to FIG. 2 showing the bed in another position.

Reference is first made to FIG. 1 which shows an exemplary bed frame **10** to which is attached a head gatch mechanism **12** for use in adjusting the head section **14** and seat section **16** of a mattress support **18.** This support is adapted to carry a conventional mattress such as that indicated at **19** in FIG. **2.**

The bed frame **10** is typical of any suitable frame and includes longitudinal members **20, 22** connected at their ends to respective transverse members **24, 26.** The longitudinal and transverse members define a rectangular frame and four legs **28** extended downwardly from corners of this frame. As is conventional, the legs are supported at their lower ends on respective castors **30.**

Three support members **32, 34,** and **36** extend transversely between the longitudinal members **20, 22.** Each of the support members is in the form of a shallow inverted U and these members are positioned so that the members **32, 34** support a leg section **38** of the mattress support **18** and the member **36** supports an outer end of the head section **14.**

The leg section **38** is attached to the members **32, 34** and is connected by a pair of pivots **40** (one of which is shown) to the seat section **16.** Pivots **42** at the other end of the seat section **16** connect this section to the head section **14.** The respective pivots **40, 42** lie on parallel transverse axes. Head section **14** is also supported by a pair of links **44, 46** which are connected at their respective lower inner sides of the longitudinal members **20, 22** by pivots **48, 50** and to the head section **14** by pivots **52, 54.** The links **44, 46** combine with the head gatch mechanism **12** to control the movement of the seat section **16** and head section **14** as these sections move between the positions shown in FIGS. **1** and **6.** These movements will be described after completing description of the structural components of the head gatch mechanism **12.**

Reference is now made to FIGS. **1** and **2** with particular reference to FIG. **2** to described the head gatch mechanism **12.** This mechanism is operated manually by a crank **56** on an outer end of a shaft **58** which is carried in a swivel bearing **60** on the transverse member **24** of the frame **10.** The shaft **58** is threaded at its inner end for engagement in threaded end piece **62** of a first element **64.** This element is telescoped at its forward end in a second element **66** for relative axial movement of one element relative to the other element. The element **66** is connected by a pivot **68** to a distal end of a heavy bracket **70** attached to the underside of the head section **14** adjacent the pivots **42.**

The element **64** includes a cover **72** having a generally U-shaped section and attached at its end to the end piece **62.** A fillet **74** is also attached to the cover **72** and is adapted to slidably receive an elongated hardened shaft **76** forming part of the second element **66.** As seen in FIG. **3,** this shaft is also located between a pair of transverse pins **78, 80** which are engaged in the cover **72.** A washer **82** is held against these pins by a com-

pression spring **84** contained in the second element **66.**

The cover **72** also has a pair of pins **86, 88** attached to it above the shaft **76** between the fillet **74** and the pins **78, 80.** The pins **86, 88** form parts of a double-acting locking mechanism **90** which is adapted to limit relative movement between the elements **64, 66** as will be described. The mechanism **90** includes a pair of similar locking elements **92, 94** which are biased away from one another by respective tension springs **96, 98** anchored in opposition in the cover **72.** These elements are of a material which complements the shaft **76** to permit the elements to lock the shaft frictionally without substantial damage either to the elements or to the shaft. Locking element **94** is typical of both locking elements and is better seen in FIG. **4.** The element **94** fits relatively snugly inside the cover **72** to locate the element **94** transversely and the shaft **76** passes through the element **94** loosely. The spring **98** biases the element into frictional engagement with the shaft **76** and this frictional engagement will become sufficient to lock the element to the shaft under certain conditions which will be described.

Returning to FIG. **2,** the frictional engagement of the locking elements **92, 94** on the shaft **76** can be relieved by actuating a hand control **100** which is connected by a sheathed cable **102** to the locking mechanism **90.** On operating the hand control the sheath bears against the locking element **92** and the cable pulls the locking element **94** so that the elements are moved toward one another into a position such as that shown in FIG. **5.** In this position there is a minimal frictional engagement between the locking elements **92, 94** and the shaft **76** so that the elements **64, 66** are no longer locked to one another.

The element **66** includes a cover **104** to which an anchor **106** is attached for connecting an end of the shaft **76** to the cover **104.** The compression spring **84** is retained in compression between the washer **82** (FIG. **3**) and the anchor **106** to bias the elements **64, 66** apart when the locking mechanism **90** is in the position shown in FIG. **5.** The significance of this arrangement will become apparent upon describing the operation of the bed as follows.

In use, the head gatch mechanism **12** can be used conventionally with the handle control **100** in the normal or locked position corresponding to the position of the locking mechanism **90** shown in FIG. **2.** In effect the elements **64** and **66** are then locked to one another and form the equivalent of a single link connecting the heavy bracket **70** on the underside of the head section **14** to the threaded shaft **58** which is attached to the crank **56.** Consequently, upon rotating the crank in a direction corresponding to raising the head section, the bracket **70** is made to rotate in a generally anti-clockwise direction as drawn in FIG. **2.** Consequently, the head section **14** also rotates guided by its connection with the seat section **16** and the respective links **44, 46** (FIG. **1**). Further rotation of the crank **56** will ultimately result in the sections **14** and **16** taking the positions shown in FIG. **6** in which the head section **14** is at an angle of about **60** degrees to the horizontal. The seat section **16** is then inclined downwardly from the leg section **38** to better locate the patient in a sitting position.

Returning to FIG. **2,** it will be evident that use of the head gatch mechanism as just described requires that a nurse is available. However, the combination of the first and second elements **64, 66** is also intended to permit the patient to raise and lower himself as will now be described.

Imagine the situation in which the compression spring **84** is compressed sufficiently that it tends to force the second element **66** away from the first element **64** to raise the head section **14.** Such a substantial force from the spring **84** causes the friction in the locking element **94** of the locking mechanism **90** to tend to move towards the associated spring **98** about the pin **88.** This attempted movement will result in increased reaction forces between the locking element **94** and the shaft **76** to lock the shaft **76** in position relative to the element **74.** Consequently, no movement can take place in this condition. Also, if a patient or nurse were to attempt to unlock the mechanism **90** by operating the hand control **100,** the result would simply be that the locked element **94** would be unmoved and the other element **92** would be free to move under the influence of the sheathed cable **102.** The mechanism would however, remain locked. It will therefore be evident that the mechanism **90** can be unlocked by pressing downwardly on the head rest to balance the force exerted by the spring **84** on the mechanism **90.** The crank **56** can then be rotated to relax the spring until the upward force at the head rest is removed.

Consider now the situation shown in FIG. **2** in which the spring **84** is relaxed and a patient is lying on the bed. The mechanism **12** is adjusted by operating the hand control **100** and turning the crank **56** until the head section is about to move upwardly. The patient then balances the spring force and if the patient moves towards a sitting position the seat section **16** and head section **14** will follow him as seen in FIG. **6.** If he gets out of bed, then the locking element **94** will come into play automatically to prevent sudden movement of the head and seat sections under the influence of the compressed spring **84.** When a patient is to give up his bed to another patient it is preferable to relax the spring **84** by turning the crank **56.** The mechanism is then adjusted to the weight of the next patient by turning crank **56** to compress the spring as previously described with reference to the first patient. However, if the first patient simply leaves the bed set for him and a lighter or heavier second patient then takes the bed, it will be necessary to readjust the bed.

In the case of a lighter second patient his weight will not be sufficient to unlock the locking element **94.** Consequently, he can do one of two things. Firstly he can apply more weight to the head section by moving himself or by having a nurse help him by pushing down on this section. This permits the hand control to release the locking element **94** and the crank **56** is then used to relax the spring to a condition in which the second patient is balanced. Secondly he can have a nurse turn the crank **56** to raise the head section until the limit of the travel is reached to balance the spring force. Consequently the locking elements **92, 94** can then be released using the control **100** and the crank is then used to allow the spring to relax to the desired condition to balance the patient.

In the case of a heavier second patient his weight will tend to cause the locking element **92** to lock to the shaft **76.** Here again there are two possibilities. Firstly, the patient can reduce the weight on the head section either by raising himself slightly or by having a nurse apply an upward force to the head section to permit the

control **100** to be relaxed. The crank **56** is then turned to re-set the spring compression to match the second patient's weight. Secondly, he can have a nurse turn the crank **56** to lower the head section to the limit of its travel which will cause a reaction between the head section and the support member **36** sufficient to permit the control **100** to release the locking element **92, 94** so that the spring **84** can be adjusted.

It will now be evident that when the mechanism **12** is adjusted, the head section **14** and seat section **16** move towards a sitting position under the influence of the spring **84** and return to the lowered or flat position under the influence of the patient's weight. Also, it is necessary to re-set the mechanism **12** whenever a new patient uses the bed unless this patient happens to have substantially the same weight characteristics as the previous patient.

Although the preferred embodiment shown in the drawings includes a pivotal seat section, the principle of a balanced head section can also be applied to a mattress frame in which the seat section **16** is permanently aligned with the leg section **38.** In such a structure the links **44, 46** could be eliminated and the head section would be supported at pivots **42** during movement above the support member **36.** While a structure of this type is within the scope of the invention the embodiment described with reference to the drawings provides greater advantages and is therefore considered to be preferable.

In some instances electric actuation could be preferable. The crank **56** would then be removed in favour of an electric motor and gear box to drive the shaft **58.** Generally the crank **56** and shaft **58** are typical of any suitable actuator means adapted to cause the head and seat sections to move as described.

I claim:

1. A hospital bed comprising:

a bed frame;

a mattress support coupled to the bed frame and including a head section rotatable about a horizontal axis between a horizontal position and a raised position in which the head section is inclined upwardly from said axis;

a head gatch mechanism comprising: first and second elements coupled together for axial telescopic movement relative to one another; a bracket attached to the head section and pivotally connected at a distal end thereof to an end of the second element remote from the first element; spring means coupled at its ends to said first and second element and adapted to bias the first element axially away from the second element; a double-acting locking mechanism coupled to the first and second elements and adapted to prevent relative movement between the first and second elements when a substantial force is applied to move one of said elements axially with respect to the other of the elements; control means coupled to the locking mechanism and operable to unlock the mechanism when said substantial force is removed; and actuactor means coupling the first element to the bed frame and adapted to move the first element axially relative to the bed frame, whereby when the bed is in use, the head gatch mechanism can be adjusted to the weight of a patient on the bed by first operating the control means to release the locking mechanism to permit relative movement between the first and second elements, and then moving the said first element axially using the actuactor means, so as to vary the biassing effect to the spring means until the said effect is balanced by the weight of the patient.

2. A hospital bed as claimed in claim **1** in which the second element includes a shaft and the first element includes means locating the shaft for longitudinal movement as the elements telescope relative to one another, and in which the locking mechanism comprises a pair of locking elements engaged about the shaft and movable between a released position in which the locking elements are generally perpendicular to the shaft and a locked position in which the locking elements are inclined with respect to the shaft for frictionally engaging the shaft; location means coupled to the first element and adapted to locate the locking elements relative to the first element such that the locking elements can pivot about said location means between said released and locked positions; and means biassing the locking elements towards said locked positions; the said control means being adapted to permit the locking elements to be moved from the locking positions into the released positions upon removal of said substantial force.

3. A hospital bed comprising:

a bed frame;

a mattress support coupled to the bed frame and including a head section, a seat section, and a leg section, the seat section being pivotally coupled to the leg section for movement about an axis between a horizontal position and an inclined position in which the seat section slopes downwardly from the leg section, and the head section being pivotally connected to the seat section for movement about another axis parallel to said first mentioned axis between a lowered position in planar alignment with the seat section when the seat section is in the horizontal position and a raised position in which the head section is inclined upwardly from said another axis with the seat section being in the inclined position;

link means coupling the head section to the bed frame to at least partly support the head section as this section moves between the lowered and raised positions;

a head gatch mechanism comprising: first and second elements coupled together for axial telescopic movement relative to one another; a bracket attached to the head section and pivotally connected at a distal end thereof to an end of the second element remote from the first elements; spring means coupled at its ends to said first and second elements and adapted to biass the first element axially away from the second element; a double-acting locking mechanism coupled to the first and second elements and adapted to prevent relative movement between the first and second elements when a substantial force is applied to move one of said elements axially with respect to the other of the elements; control means coupled to the locking mechanism and operable to unlock the mechanism when said substantial force is removed; and actuactor means coupling the first element to the bed frame and adapted to move the first element axially relative to the bed frame, whereby when the bed is in use, the head gatch mechanism can be adjusted to

the weight of a patient on the bed by first operating the control means to release the locking mechanism to permit relative movement between the first and second elements, and then moving the said first element axially using the actuactor means, so as to vary the biassing effect of the spring means until the said effect is balanced by the weight of the patient.

4. In a hospital bed of the type having a bed frame, a mattress supported above the frame and coupled to the bed frame, and a head gatch mechanism coupled to the bed frame and to a head section of the mattress support for moving the head section between a horizontal position and an inclined position, the improvement in which the head gatch mechanism comprises: first and second elements telescopically interconnected for axial movement relative to one another; spring means coupled at its ends to said first and second elements, said spring means. biasing the elements away from one another; means coupling the second element to the head section; a double acting locking mechanism coupled to the first and second elements and adapted to prevent movement between the first and second elements when a substantial force is applied to move one of said elements; and actuactor means coupled to the first element and to the bed frame and adapted to move the first element axially relative to the bed frame, whereby when the bed is in use, the head gatch mechanism can be adjusted to the weight of a patient on the bed by first releasing the locking mechanism to permit relative movement between the first and second elements, and then by moving the said first element axially using the actuactor means so as to vary the biassing effect of the spring means until the said effect is balanced by the weight of the patient.

5. Apparatus as claimed in claim **4** in which the second element includes a shaft and the first element includes means locating the shaft for longitudinal movement as the elements telescope relative to one another, and in which the locking mechanism comprises a pair of locking elements engaged about the shaft and movable between a released position in which the locking elements are generally perpendicular to the shaft and a locked position in which the locking elements are inclined with respect to the shaft for frictionally engaging the shaft; location means coupled to the first element and adapted to locate the locking elements relative to the first element such that the locking elements can pivot about said location means between said released and locked positions; means biassing the locking elements towards said locked positions; and control means adapted permit the locking elements to be moved from the locking positions into the released positions upon removal of said substantial forces.

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