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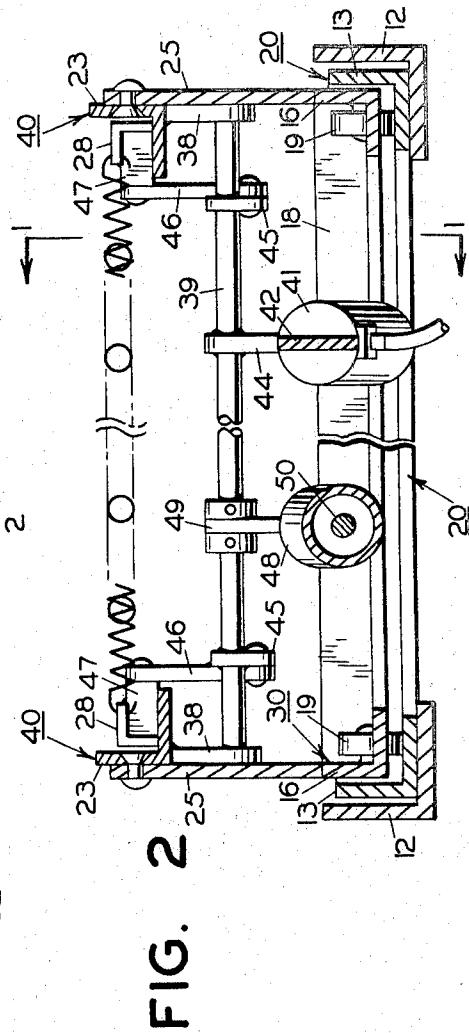
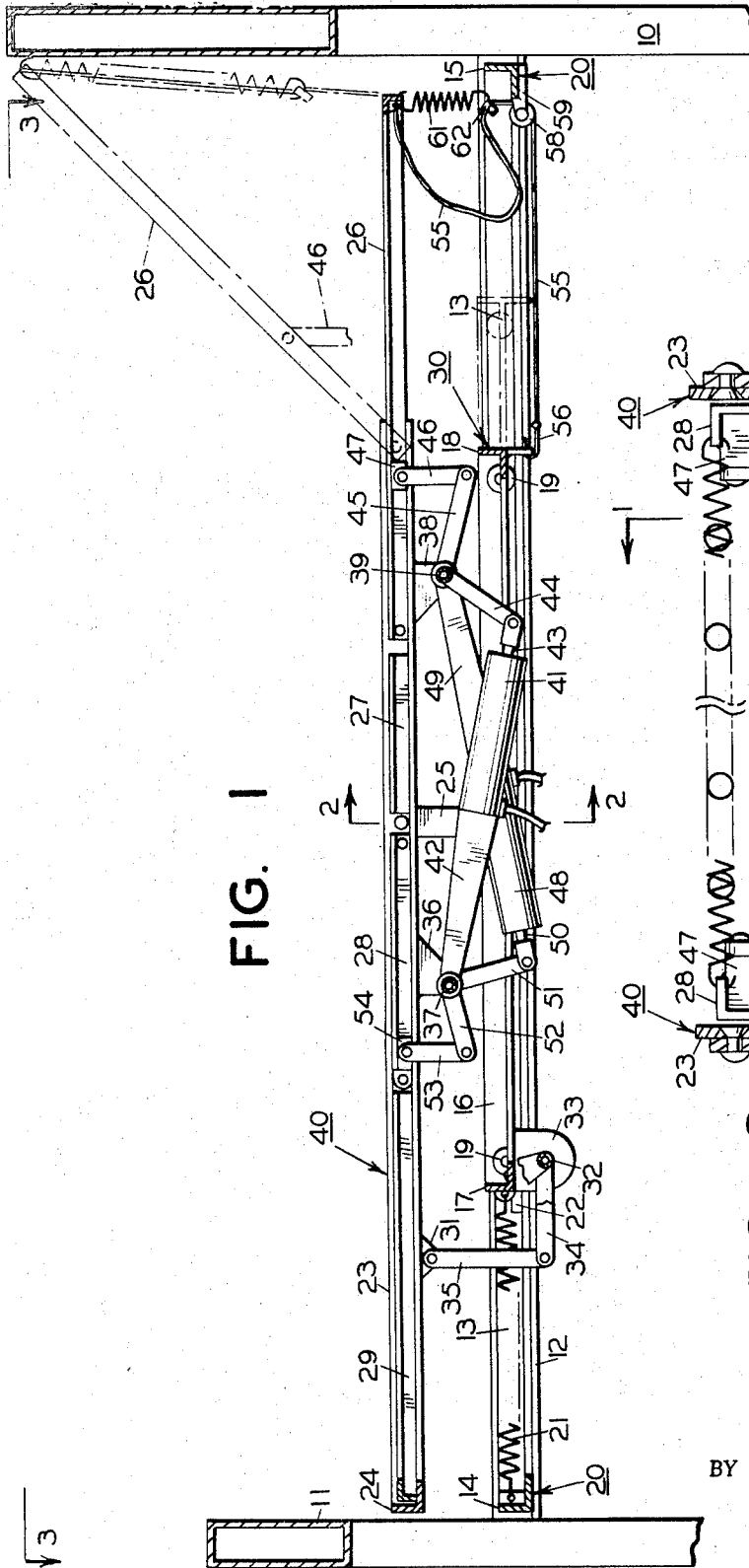
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3,402,408

ADJUSTABLE HOSPITAL BED

Filed July 24, 1967

3 Sheets-Sheet 1



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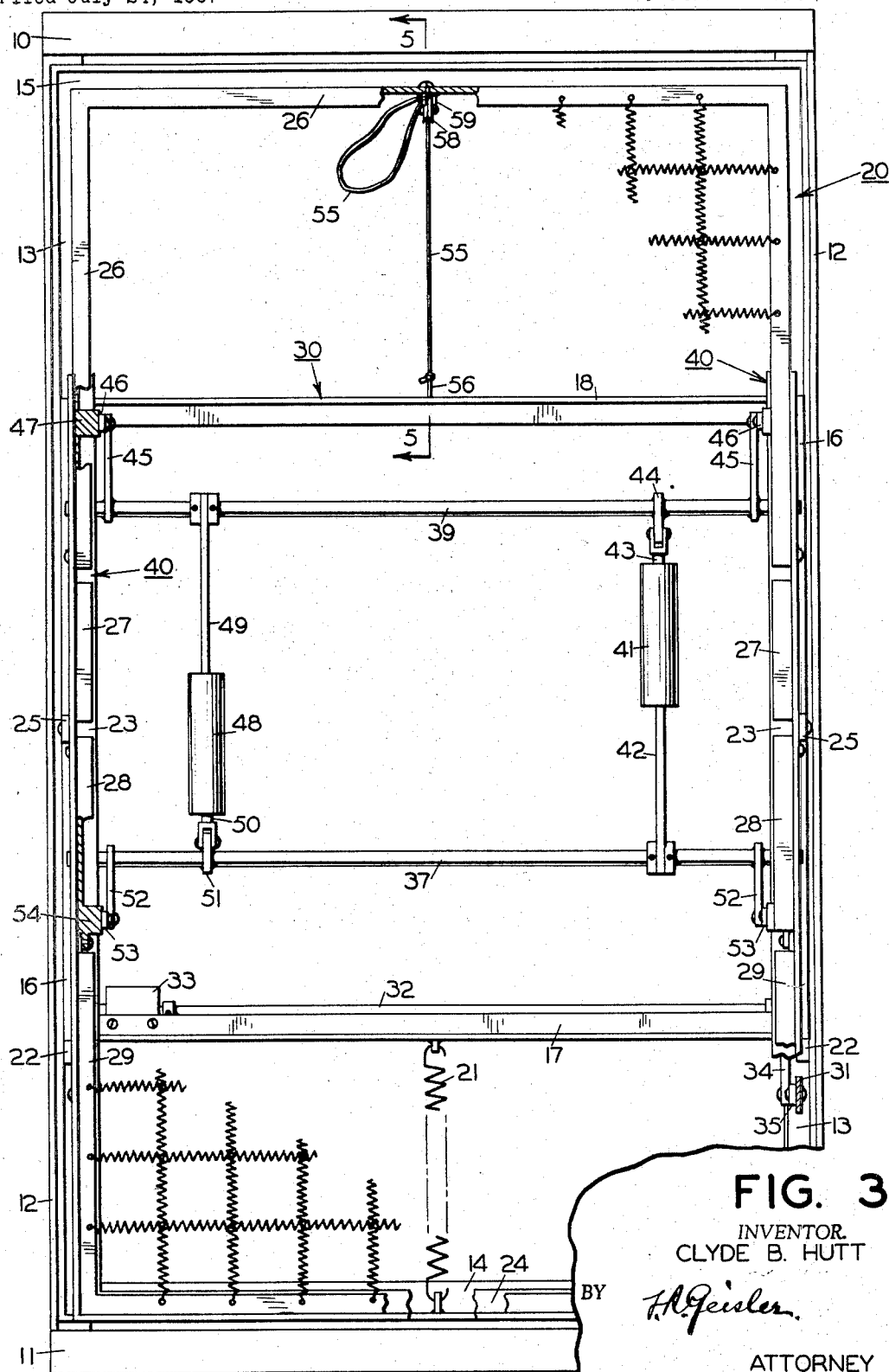
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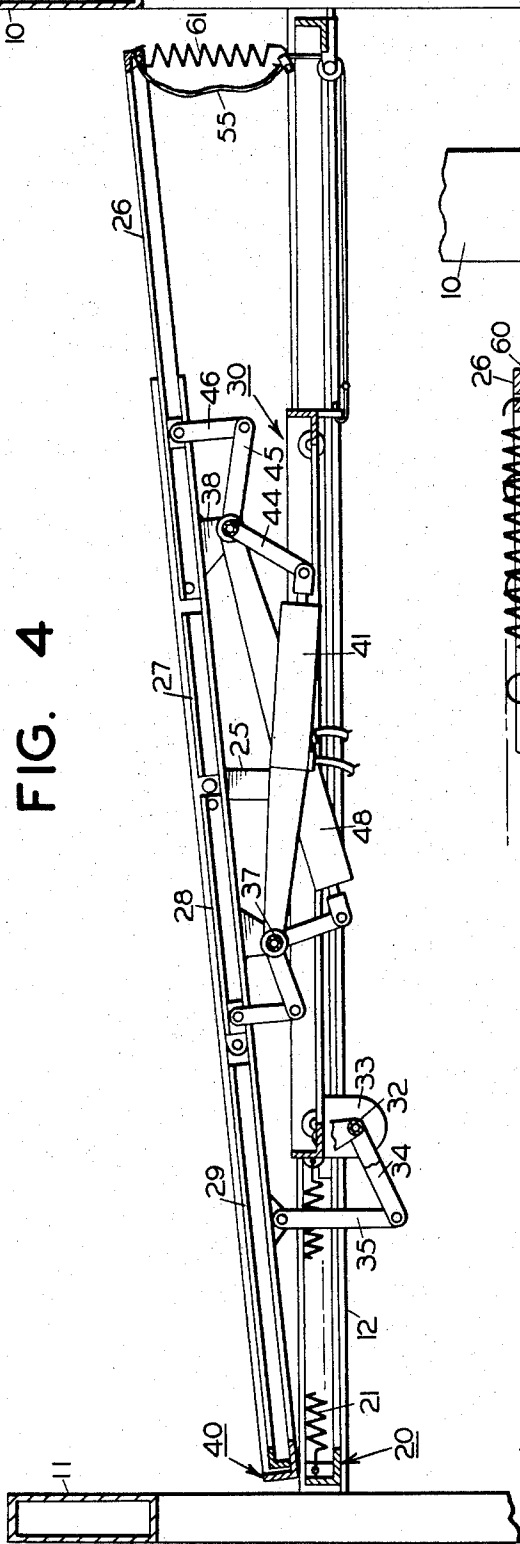


FIG. 4

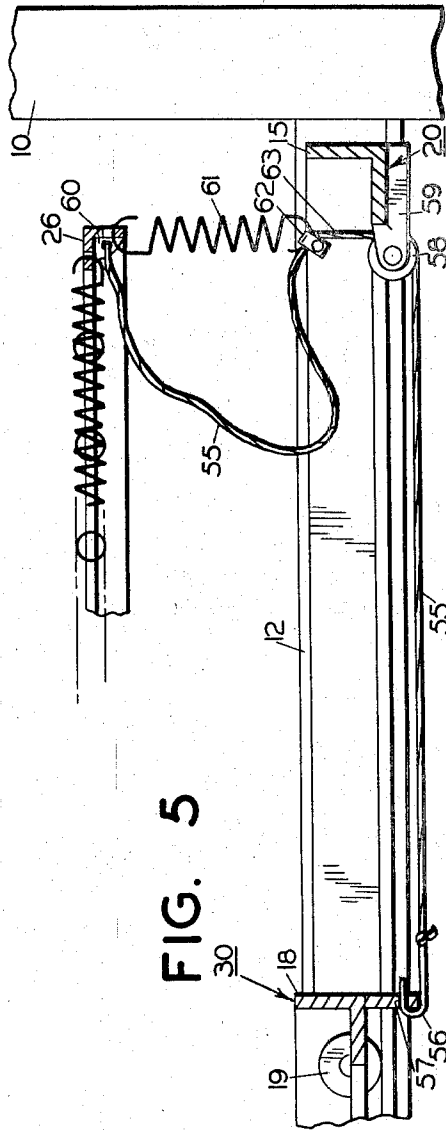


FIG. 5

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ADJUSTABLE HOSPITAL BED
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ABSTRACT OF THE DISCLOSURE

A hospital bed which, in addition to the various adjustable features provided on modern hospital beds, is also provided with means for automatically shifting the mattress and spring portion of the bed toward the headboard, if so desired, when the head section of the mattress and spring portion are adjusted to support the patient in sitting-up position.

Background of the invention

It has long been customary for hospital beds to be provided with means whereby the head section and the foot or knee section of the mattress and spring portion may be inclined upwardly. Modern hospital beds also have means so arranged that the entire mattress and spring portion, while extending in a single plane, may be tilted into a desired inclined position. United States Letters Patent No. 2,687,563, issued Aug. 31, 1954, and United States Letters Patent No. 3,201,806, issued Aug. 24, 1965, describe hospital beds in which such features are provided.

Formerly the raising of the head section of a mattress and spring portion in a hospital bed sufficiently to enable the patient to sit up in bed resulted in causing the patient to be positioned relatively further forward with respect to the stationary bedside cabinet located adjacent the head of the bed. This made the bedside cabinet less available for or convenient to the patient, unless the cabinet could be moved forward temporarily. Consequently a further feature has more recently been developed for hospital beds whereby the mattress and spring portion will be moved longitudinally towards the headboard at the end of the bed when the head section of the mattress and spring portion is raised to cause the patient to sit up in bed. United States Letters Patent No. 3,237,212, issued Mar. 1, 1966, describes one form of hospital bed construction and mechanism which provides this feature.

Summary of the invention

In the improved bed of the present invention the head and/or foot and knee sections of the mattress and spring portion can be raised and inclined upwardly as and when desired, and the raising of the head section sufficiently to enable the patient to sit up in bed will, if desired, automatically cause the mattress and spring portion to move longitudinally towards the headboard of the bed so as to enable the convenient relative location of the stationary bedside cabinet with respect to the raised head portion of the patient to be substantially maintained. Also, the entire mattress and spring portion may be tilted as a unit in either direction to a limited extent without causing any longitudinal movement of the mattress and spring portion in the bed frame.

An object of the present invention is to provide an improved adjustable bed in which these functions are performed with the employment of simplified and practical mechanism so as to enable such bed to be manufactured and sold within an attractive cost range.

While under ordinary circumstances it is desirable to have the mattress and spring portion slid towards the headboard of the bed, as mentioned, when the patient is placed into sitting-up position, on the other hand, under

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some circumstances, as for example when the patient is under traction, any longitudinal movement of the mattress and spring portion with respect to the bedstead main frame would be undesirable. Consequently it is another feature of the present invention that the means by which the mattress and spring portion ordinarily is automatically caused to be moved longitudinally by the raising of the head section of the mattress and spring portion into sitting-up position, can be easily temporarily rendered inoperative when shifting of the mattress is not desired, and then subsequently easily again returned to operative position.

An additional object of the present invention is to provide a self-contained assembly for a hospital bed, embodying all the aforementioned features, which can easily be mounted in the main frame of an ordinary bed in place of a customary spring and mattress assembly.

Brief description of the drawings

Referring to the drawings:

FIG. 1 is a sectional side elevation of a hospital bed, with the mattress omitted, embodying the present invention, this sectional elevation being taken on the line indicated at 1—1 of FIG. 2, showing the upper frame, on which the spring sections are carried, in normal position with the spring sections all extending in the same horizontal plane, but indicating in broken lines the position of the upper spring-supporting frame and also the position of a lower intermediate frame, on which the upper frame is carried, when the head section of the spring portion is raised to support the patient in sitting-up position;

FIG. 2 is a foreshortened section on line 2—2 of FIG. 1 drawn to a larger scale;

FIG. 3 is a plan view on line 3—3 of FIG. 1;

FIG. 4 is a sectional side elevation similar to FIG. 1, but showing the upper spring-supporting frame in an inclined position; and

FIG. 5 is a fragmentary sectional elevation taken on line 5—5 of FIG. 3 but drawn to a larger scale.

Referring first to FIGS. 1 and 2, the entire bed assembly includes a bed main frame of more or less standard construction having the customary headboard 10 and footboard 11 connected by the usual pair of side rails 12. A stationary open rectangular base frame 20, consisting of a pair of side angle iron members 13, joined at the ends by end angle iron members 14 and 15 is set on the main bed frame, the size of the base frame 20 being such that the side angle iron members 13 will be received in the side rails 12 respectively of the main bed frame (FIG. 2) when the base frame 20 is in place, and the end angle iron members 14, 15 of the base frame will be positioned inside of and adjacent to the footboard and headboard of the bed main frame respectively.

An intermediate open rectangular frame 30, of slightly less width than the rectangular base frame 20, and much shorter in length, is mounted in the rectangular base frame and is similarly composed of a pair of angle iron side members 16, 16 connected at their ends by angle iron end members 17, 18. This intermediate frame 30 is mounted for longitudinal sliding movement in the base frame 20 and is supported on pairs of rollers 19 near each end, which rollers ride on the angle iron side members 13 of the base frame 20.

A coil spring 21, which is under tension at all times, has one end attached to the end member 14 of the base frame 20 adjacent the footboard of the bed and the other end attached to the corresponding end member 17 of the intermediate frame 30. The spring 21 normally holds the intermediate frame 30 in the position shown in FIG. 1, with the end of the intermediate frame engaging a pair of stops 22 on the side members 13 respectively of the rectangular base frame 20, but enables the intermediate frame 30 temporarily to be slid along the base frame 20 (to the

right as viewed in FIG. 1) against the force of spring 21 as later explained.

An upper spring-supporting frame 40 comprises a pair of side angle iron members 23 (FIGS. 1 and 2) integrally connected at one end (thus the end nearest the footboard of the bed) by an end angle iron member 24. As shown in FIG. 1, this upper spring-supporting frame 40, with its side members 23, is shorter than the base frame 20 but longer than the intermediate frame 30, and in the normal location, shown in full lines in FIG. 1, the foot portion of this upper frame 40 terminates close to the footboard 11 of the bed.

A pair of bracket arms 25, welded to or formed integral with the angle iron side members 16 of the intermediate frame 30 respectively, and positioned at the longitudinal center of these side members 16, extend vertically upward from the intermediate frame 30, and the upper spring-supporting frame 40 is pivotally supported on this pair of bracket arms 25, the side members 23 of the upper frame 40 being pivoted to the arms 25 respectively. The angle iron side members 23 of the upper frame 40 (as shown in FIG. 2) are so arranged as to have inwardly extending horizontal bottom flanges and outer upwardly extending side flanges.

Four mattress-supporting spring panels 26, 27, 28, 29, which provide the immediate support for the mattress (not shown), are supported in the upper frame 40, and, in their normal position, rest inside the frame 40 and thus extend in the same plane when in normal position. The head spring panel 26 is hinged to the side members 23 of the upper frame 40 by suitable hinge pins in order that it may be swung upwardly from the frame 40 so as to support the patient in sitting-up position when desired. The intermediate panel 27 is firmly secured by suitable means in the frame 40. The panel 28 is pivotally mounted, by suitable hinge pins, so that it may be swung upwardly with respect to the intermediate panel 27 and supporting frame 40. The panel 29 is hingedly connected to the panel 28. This particular relative arrangement of mattress-supporting spring panels is customary in hospital beds.

A pair of ears 33, one of which is shown in FIG. 1, extend down from the side members 16 respectively of the intermediate frame 30 at the same location, and these ears support a cross shaft 32 which extends across beneath the frame 30. A motor 33, supported from the end member 17 of the frame 30, rotates the cross shaft 32. A pair of arms 34, secured on the cross shaft 32 near its ends respectively, are connected by a pair of links 35 respectively to a pair of ears 31 which extend down from the side members 23 respectively of the upper frame 40. Thus, with operation of the motor 33 to a limited extent in either direction, the entire upper frame 40, and with it the spring panels and mattress, may be tilted to a limited extent in either direction with respect to the intermediate frame 30 and main base frame 20, as shown for example in FIG. 4.

A second pair of ears 36 extend down from the side members 23 respectively of the upper frame 40 and rotatably support a second cross shaft 37; and similarly a third pair of ears 38 extend downward from the side members 23 respectively and rotatably support a third cross shaft 39.

A first hydraulic cylinder 41 (FIG. 1) has a mounting bracket arm 42 pivotally supported on the cross shaft 37. A piston in this cylinder 41 has a piston rod 43, the outer end of which is pivotally attached to an arm 44 firmly secured on the rotatable cross shaft 39. A pair of arms 45 (see also FIG. 3) are secured on the shaft 39 near its ends respectively, and these arms are pivotally connected to a pair of links 46 respectively. The opposite ends of these links 46 are pivotally connected to a pair of blocks 47 respectively which are secured to the respective sides of the head spring panel 26.

Thus the delivery of hydraulic fluid behind the piston in the hydraulic cylinder 41, causing the piston rod 43 to move outwardly with respect to the cylinder, will result in

the spring head panel 26 being swung up on its hinge mounting with respect to the upper frame 40, and subsequent withdrawal of the hydraulic fluid from the cylinder 41 will return the head panel 26 to its normal position in the plane of the upper frame 40.

A second hydraulic cylinder 48, similar to hydraulic cylinder 41 but oppositely positioned, has a mounting bracket arm 49 (FIG. 1) pivotally mounted on the cross shaft 39. The piston in this hydraulic cylinder has a piston rod 50 which is pivotally connected to an arm 51 secured on the cross shaft 37. A pair of arms 52 are secured on the cross shaft 37 near its ends respectively, and these arms are pivotally connected to a pair of links 53 respectively, the opposite ends of which links are pivotally connected to a pair of blocks 54 respectively which are secured to the respective sides of the spring panel 28. Thus, as apparent, delivery of hydraulic fluid under pressure behind the piston in cylinder 48 will result in spring panel 28, and therewith spring panel 29, being lifted from their normal positions within the upper frame 40, and subsequent withdrawal of the hydraulic fluid from cylinder 48 will cause these two panels to return to their normal positions in the plane of the upper frame 40.

The hydraulic cylinders 41 and 48 are connected by flexible tubes (not shown) to a hydraulic fluid assembly comprising a pump, hydraulic reservoir, and pump-operating motor, located in a housing (not shown) mounted in any suitable and convenient location on either of the frames 30 or 40. This hydraulic fluid assembly involves nothing new in itself and consequently is not described.

A flexible cable 55 (FIGS. 1, 3, 5) has its lower end removably attached (by any suitable means such as the hook 56) to an element (such as the metal eye loop 57) secured to the end member 18 of the intermediate frame 30. This cable 55 passes around a pulley 58 mounted on a bifurcated bracket 59 on the end member 15 of the base frame 20. The other end of this cable is secured in any suitable manner to a lug 60 in the end of the head panel 26 in the top frame 40. The length of this cable is such that when the panel 26 and the spring-supporting frame 40 are in the normal position (as shown in full lines in FIG. 1) there will be considerable slack in the cable. In order to take up this slack a coil spring 61 has its upper end attached to the lug 60 and its lower end attached to a clamp 62 on the cable 55. The coil spring 61 is under slight tension when the head panel 26 is in normal position, and, by taking up the slack, prevents the lower portion of the cable from hanging down loosely. The spring 61, however, is much lighter than the spring 21, by which the intermediate frame 30 is normally held against the stops 22, previously mentioned, so that tension on the lighter spring 61 will never cause any travel of the frame 30 on the base frame 20. Thus no longitudinal movement of the upper frame 40 and the bed mattress will occur when the tension of spring 61 is increased by the tilting of the upper frame 40 in the manner illustrated in FIG. 4. However, the amount of slack in the cable 55 is such that when the head panel 26 is swung upwardly to the full extent required for supporting the patient in sitting-up position, not only will all the slack in the cable be taken up, but the further pull of the cable will then cause the intermediate frame 30, and therewith the upper frame 40 and the entire spring and mattress section, to be moved (to the right as viewed in FIG. 1) against the force of spring 21.

By this means the spring and mattress section of the assembly will be caused to travel towards the headboard of the bed normally when the head panel is raised sufficiently to bring the patient into sitting-up position.

As mentioned previously, under some circumstances it may be undesirable to have any longitudinal travel of the spring and mattress section occur when the head panel is raised. In such case, all that is necessary is to disen-

gage the lower end of the cable 55 from the securing element on the intermediate frame 30.

Thus this very simplified arrangement and mechanism enable the spring and mattress section to be automatically moved a short distance toward the headboard of the bed and thus moved with respect to the stationary bedside table, when, but only when, such movement is desired. The various other adjustments in the bed assembly, including the tilting of the spring and mattress portion to a moderate extent in either direction, are not sacrificed. Furthermore the combined assembly, comprising the base frame 20, the intermediate frame 30 and the top spring-supporting frame 40, and the parts and various members in the top frame 40, form a composite movable and removable assembly adapted to be quickly installed in any ordinary bedstead of proper size merely by being set in place therein.

In the specification the mattress-supporting panels in the top frame 40 have been illustrated and described as spring panels, and thus panels comprising the usual frame structure with inter-connecting spring wires. However, since thin metal panels are also very commonly used in such beds for supporting the mattress, it is to be understood that thin metal panels may be substituted in place of the mentioned spring panels. Consequently in this specification the mattress-supporting spring panels are to be understood as panels comprising either actual wire springs or panels of thin metal. Also a thin chain could be substituted for the flexible cable 55 and the term "flexible" cable is to be understood as including any similar and suitable flexible element.

I claim:

1. An adjustable hospital bed assembly including a main bed frame having a headboard, a footboard, and side rails, an open rectangular intermediate frame in said assembly, said intermediate frame being shorter than said main bed frame, means for supporting said intermediate frame in said main bed frame for translatory movement longitudinally with respect to said main bed frame, the head end of said intermediate frame normally spaced from said headboard of said main bed frame, a top frame tiltably supported on said intermediate frame, means connected with said top frame and said intermediate frame controlling the tilting of said top frame with respect to said intermediate frame, a series of mattress-supporting panels carried by said top frame, a head panel in said series hingedly mounted in said top frame, means carried by said top frame for swinging said head panel upwardly from the plane of said top frame, a flexible cable having its upper end connected with said head panel, a pulley supported on a stationary mounting below said top panel and adjacent to said headboard of said main frame, said cable passing around said pulley, means for detachably connecting the lower end of said cable with the head end of said intermediate frame, the length of said cable being such as to result in slack in said cable at all times except when said head panel is raised substantially, whereby the raising of said head panel beyond the extent at which the slack is taken up in said cable when said lower end of said cable is connected with said intermediate frame will cause the resulting pull on said cable to move said intermediate frame, and therewith said top frame, towards said headboard of said main bed frame, and means connected with said intermediate frame for automatically returning said intermediate frame, and therewith said top frame, to normal position longitudinally with respect to said main bed frame when said head panel is returned to lower position.

2. The adjustable bed as described in claim 1 with the addition of a slack take-up spring connected with said flexible cable, the force exerted by said slack take-up spring being weaker than said means for automatically returning said intermediate frame to normal position.

3. An adjustable hospital bed assembly comprising a main bed frame having a headboard, a footboard and side rails, an open rectangular base frame of substantially the same size as said main bed frame removably placed in said main bed frame and resting on said side rails, an open rectangular intermediate frame, said intermediate frame being shorter than said main bed frame and said base frame, means for supporting said intermediate frame on said base frame for translatory movement longitudinally with respect to said base frame and said main bed frame, the head end of said intermediate frame normally spaced from the head end of said base frame and said headboard of said main bed frame, a top frame tiltably supported near its longitudinal center on said intermediate frame, means connected with said top frame and said intermediate frame controlling the tilting of said top frame with respect to said intermediate frame, a series of mattress-supporting panels carried by said top frame, a head panel in said series hingedly mounted in said top frame, means carried by said top frame for swinging said head panel upwardly from the plane of said top frame, a flexible cable having its upper end connected with said head panel, a pulley supported on the head end of said base frame, said cable passing around said pulley, means for detachably connecting the lower end of said cable with the head end of said intermediate frame, the length of said cable being such as to result in slack in said cable at all times except when said head panel is raised substantially, whereby the raising of said head panel beyond the extent at which the slack is taken up in said cable, when said lower end of said cable is connected with said intermediate frame, will cause the resulting pull on said cable to move said intermediate frame, and therewith said top frame, towards said headboard and said main bed frame, and spring means connecting the opposite end of said intermediate frame with said first frame for automatically returning said intermediate frame therewith said top frame to normal position longitudinally with respect to said base frame and said bed frame when said head panel is returned to lower position.

4. The adjustable bed as described in claim 3 with the head and foot ends of said intermediate frame normally spaced longitudinally from the head and foot ends of said base frame respectively and therewith from said headboard and said footboard of said main frame, and with the addition of stop means limiting the movement of said intermediate frame towards the foot end of said base frame, and a slack take-up spring connected with said flexible cable, said slack take-up spring being weaker than the spring means connecting the foot ends of said intermediate frame and said base frame.

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