

Feb. 28, 1967

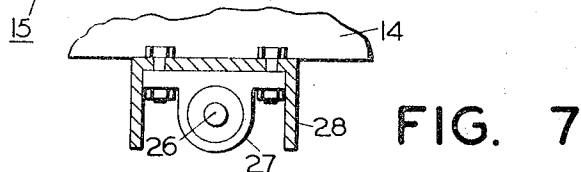
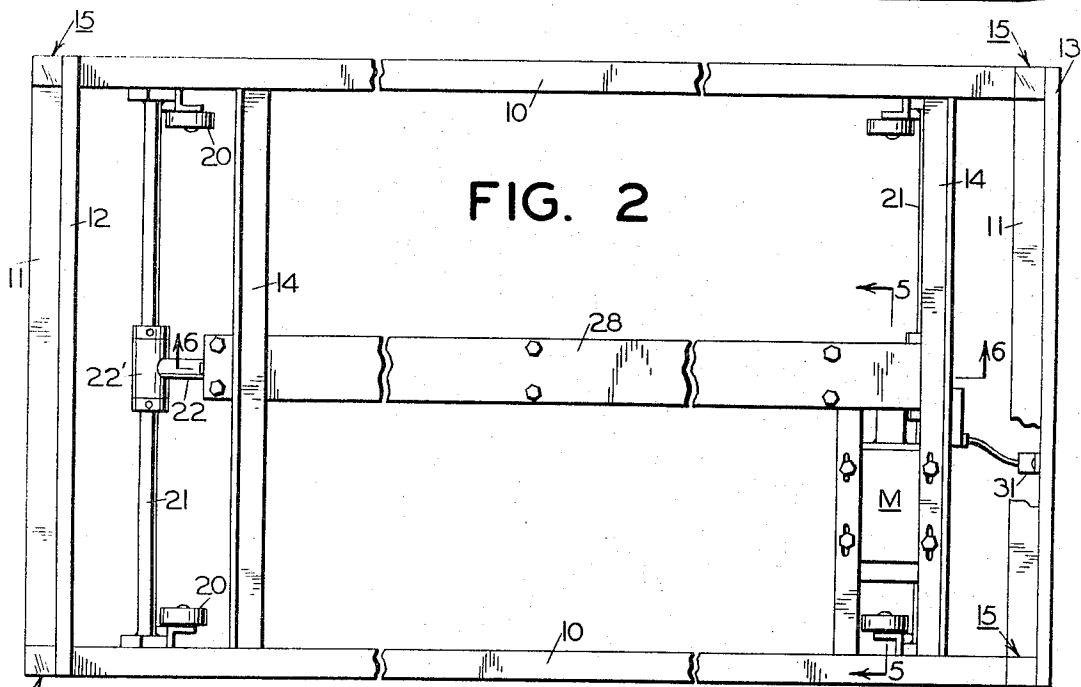
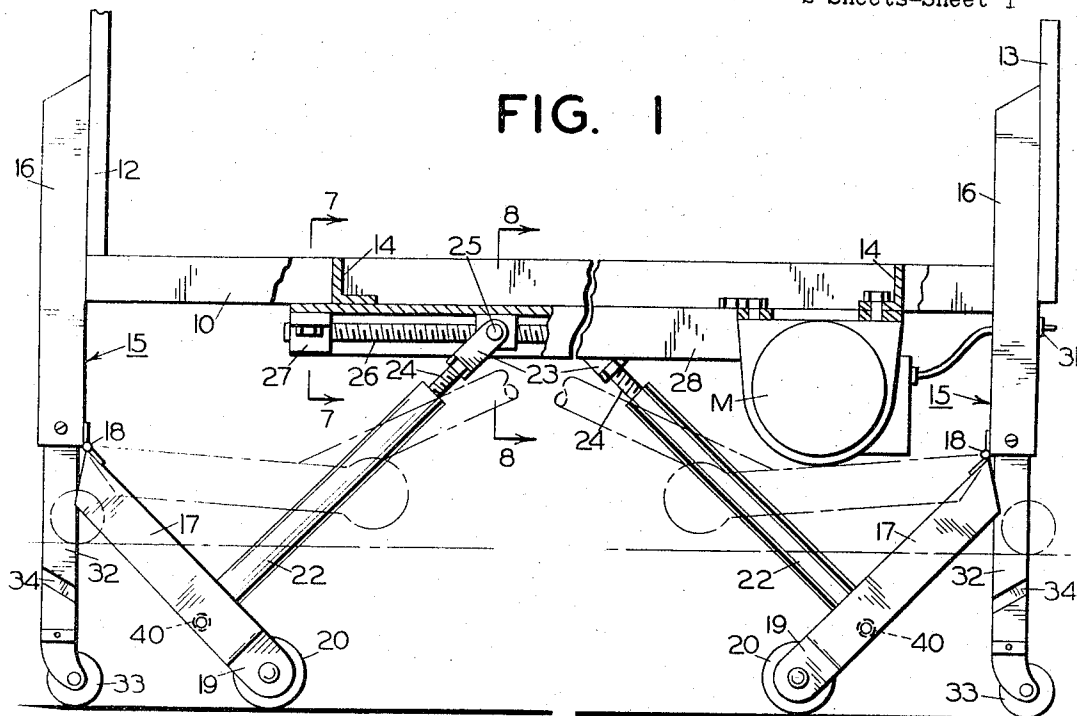
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3,305,876

ADJUSTABLE HEIGHT BED

Filed June 30, 1966

2 Sheets-Sheet 1



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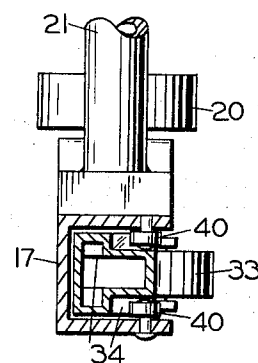
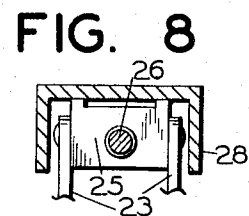
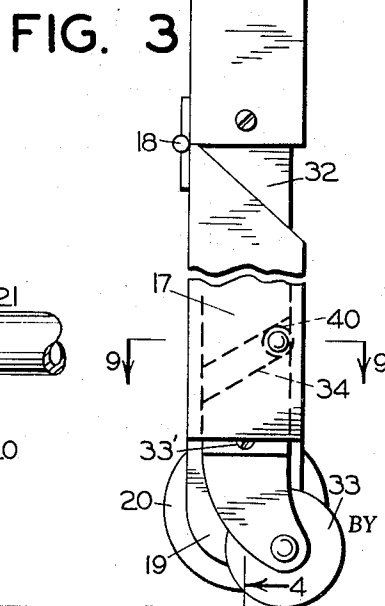
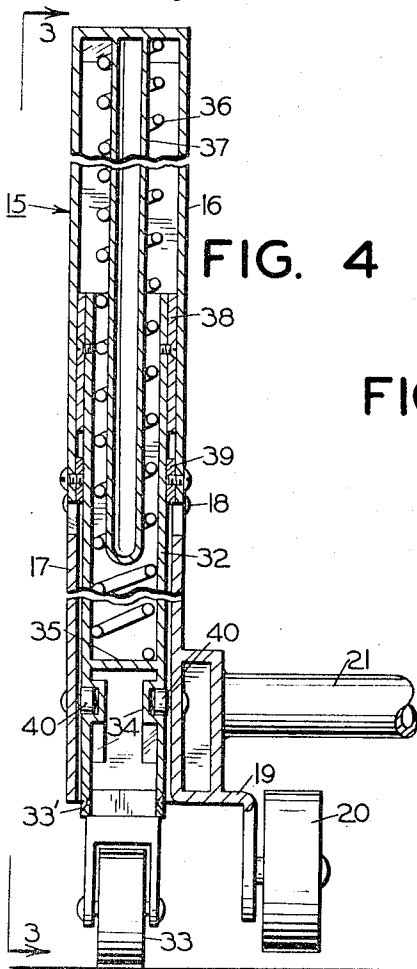
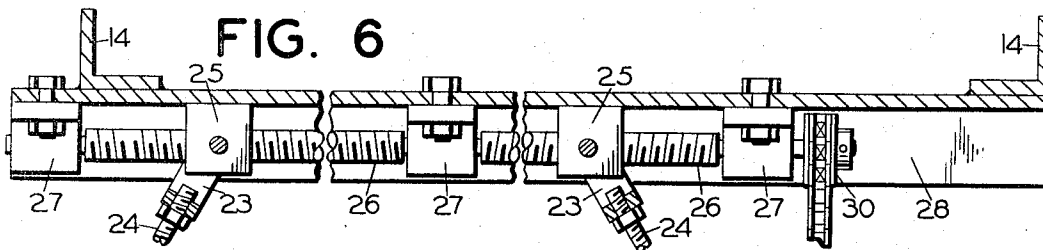
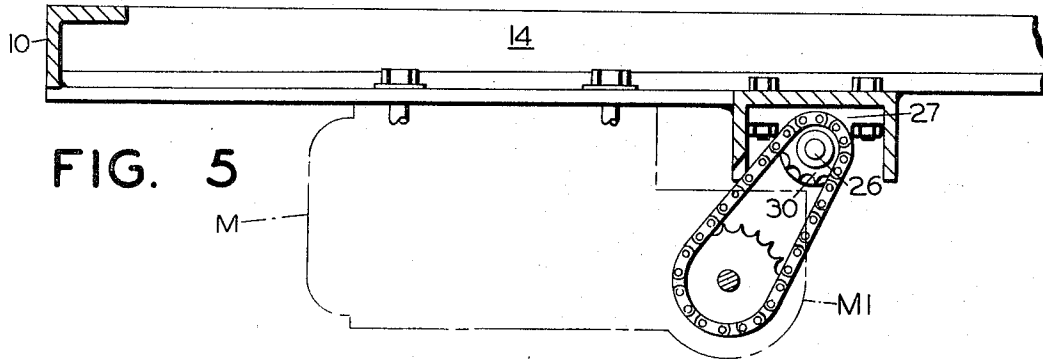
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2 Sheets-Sheet 2



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ADJUSTABLE HEIGHT BED

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4 Claims. (Cl. 5-11)

This invention is concerned with beds, and, more particularly, with invalid or hospital beds with which it is desirable, if not essential, that the height of the spring and mattress from the floor should be adjustable.

As is well known, in the customary hospital bed, the spring and mattress are generally located at a relatively high level above the floor as a convenience and aid to doctors, nurses and attendants when administering to the patient. However, at other times, especially with patients during the ambulatory stages of convalescence, it is desirable that the spring and mattress should be positioned at a lower level so as to enable the patient to get out of bed and back into bed, when he is in condition to do so, without hazard or unnecessary difficulty.

The object of the present invention is to provide an improved, adjustable height bed in which the raising or lowering of the spring and mattress can be easily, quickly and smoothly accomplished without any annoyance or disturbance to the patient.

Another object of the invention is to provide an improved adjustable height bed which, when in fully raised or fully lowered position, can be easily moved in any desired direction on the floor, but the adjustment of which from fully raised to fully lowered position, or vice versa, will not cause any inadvertent traveling of the bed on the floor.

The manner in which, and the means by which, these objects and other advantages are obtained with the adjustable bed of the present invention, and certain details of construction in the mechanism employed, will be briefly described and explained with reference to the accompanying drawings, wherein:

FIG. 1 is a foreshortened side elevation of a bed embodying the present invention showing in full lines the bed in intermediate position between fully raised and fully lowered positions, and indicating in broken lines the position of the legs and extensible leg members when the bed is in fully lowered position; the springs and mattress being omitted from this and the other figures in the drawings for clarity;

FIG. 2 is a foreshortened top plan view of the bed of FIG. 1 drawn to a smaller scale;

FIG. 3 is a fragmentary, foreshortened elevation of the corner leg assembly which is located on the right of FIG. 1, but with the bed in fully raised position, drawn to a larger scale than FIG. 1, this figure being also an elevation taken on line 3-3 of FIG. 4;

FIG. 4 is a sectional elevation on line 4-4 of FIG. 3;

FIG. 5 is a fragmentary enlarged section on line 5-5 of FIG. 2;

FIG. 6 is a fragmentary foreshortened sectional elevation on line 6-6 of FIG. 2, drawn to a larger scale;

FIG. 7 is a fragmentary section on line 7-7 of FIG. 1, drawn to a larger scale;

FIG. 8 is a fragmentary section on line 8-8 of FIG. 1, drawn to the same scale as FIG. 7; and

FIG. 9 is a cross section on line 9-9 of FIG. 3.

The bed of the present invention in many respects is similar to that described in U.S. Letters Patent No. 2,985,891, dated May 30, 1961, and similarly entitled "Adjustable Height Bed" to which reference should be made. Like the bed in said previous patent, the bed of the present invention has a frame with four corner leg assemblies, each of which has a hinged main lower section which is in vertical position when the bed is in maxi-

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mum raised position and which is swung inwardly beneath the bed for lowering the bed, and each of the leg assemblies also has an auxiliary lower extensible member mounted in vertical position. However, in the bed of said patent it is necessary to have a freely swiveling caster on the bottom of the hinged lower main section of each corner leg assembly to enable the bed in raised position to be freely movable on the floor, and the movement of these freely swiveling casters along the floor during the lowering or raising of the bed tends to produce inadvertent traveling of the bed on the floor. Also, when some of the weight of the bed is placed on these casters, which occurs when the casters contact the floor during the lowering of the bed from maximum raised position, or the raising of the bed from maximum low position, causes these casters to swing up 180° in their swivel mountings and produce a downward jarring of the bed. These difficulties have been overcome in the present invention by a novel change in construction in which the necessity of having swiveling casters on the hinged lower main sections the corner leg assembly is eliminated.

Referring first to FIGS. 1 and 2, the bed includes a rectangular frame having the usual pair of side rails 10, end rails 11, headboard structure 12 and foot board structure 13. The frame is also provided with a pair of transverse members 14 extending across between the side rails 10. A corner leg assembly 15 is mounted at each corner of the frame, secured to the adjacent ends of the side rail and end rail, and to the head or footboard structure as the case may be.

Each corner leg assembly 15 consists of a hollow or tubular upper section 16, preferably square in cross section, and a lower main section 17, which is connected to the upper section 16 by a hinge 18 to allow pivotal movement of the lower main section from vertical position (with the bed in fully raised position) to substantially horizontal position (with the bed in fully lowered position).

For a reason presently apparent, the hinged lower main section 17 of each leg assembly is U-shaped in cross section (FIG. 9), being open on the face opposite from the direction in which the lower main section swings, thus having a rear wall facing the direction in which this section swings and a pair of side walls. The innermost side wall of this lower main section is formed with an offset bracket foot extension 19 (see FIG. 4) on which is secured a stub shaft which provides the mounting for a floor-engageable wheel 20. The pair of lower main leg sections 17 at each end of the bed are rigidly connected together by a cross-rod 21 (FIGS. 2 and 4). A pair of positioning arms 22 (FIGS. 1 and 2) have their lower or outer ends secured to sleeves 22 on the cross-rods 21 respectively (one of which is shown in FIG. 2), which sleeves are rotatively mounted on the cross-rods 21, and thus the positioning arms 22 have pivotal connection with the cross-rods 21 connecting the pairs of lower main leg sections 17.

The upper or inner end of each positioning arm 22 is connected with a U-shaped shackle 23 (FIGS. 1, 6 and 8) by means of an adjustable member 24, which member has threaded engagement with the end of the positioning arm 22 and with the shackle 23, and each shackle 23 is pivotally mounted on a nut 25. The two nuts 25 are mounted on opposite halves of a left and right hand worm 26 which is rotatively supported at its mid-point and near each end in suitable bearing mountings 27. The bearing mountings 27 in turn are supported from an inverted channel member 28 (FIGS. 1, 2, 6 and 7) which is supported from the transverse frame member 14. The pair of nuts 25 slide on a guide rail 29 (FIG. 8) in the channel member 28 and move in opposite directions when the left and right hand worm 26 is rotated. Thus rotation

of the left and right hand worm 26 in one direction causes the lower main sections 17 to move inwardly from vertical to horizontal position for the lowering of the bed, and subsequent opposite rotation of the worm 26 causes the leg sections 17 to move outwardly from substantially horizontal position back to vertical position in bringing the bed back to fully raised position.

Rotation of the left and right hand worm 26 is produced by means of a reversible electric motor M and a suitable gear box M1 with a drive sprocket connected by sprocket chain with a sprocket 30 (FIGS. 5 and 6) secured to the end of the worm 26. Operation of the motor is controlled by a suitable switch indicated at 31 in FIGS. 1 and 2, and limit switches (not shown) are also provided to stop the operation of the motor whenever the nuts 25 reach the extent of prescribed travel in either direction.

To supply boosting means to aid in raising the bed from lowered to raised position, and also to enable the bed to be mounted on freely swiveling casters in either the fully raised or fully lowered positions, without incurring the objectionable feature mentioned earlier, of requiring swiveling casters also to be mounted on the main lower hinged leg sections 17 of the leg assemblies, each leg assembly is provided with an extensible, partially spring-operated, supplemental leg member 32, now to be described.

The extensible supplemental leg member 32 (FIGS. 1, 3, 4 and 9) is slidably mounted in the upper section 16 of each corner leg assembly 15 and is also slidable in the hinged lower main leg section 17 when the latter is in vertical position. The member 32 is rectangular or square in cross section. A caster 33 is carried in a swivel mounting 33' at the bottom end of the member 32. The two opposite side walls of member 32, at a short distance above the bottom end of the member, are each formed with an inclined channel 34. These two channels 34 in the member 32 are identical, both are located in the same inclined plane extending upwardly toward the corresponding end of the bed, and serve as a pair of ramps in a manner hereafter explained.

A transverse inner wall 35 (FIG. 4) is secured in the member 32 above the ramps 34, and a spring 36 has its top end engaging the top of the upper section 16 of the leg assembly and its bottom end engaging the transverse wall 35 in member 32. A metal tube 37, secured to the top of the upper section 16, extends downwardly through the center of the upper section 16 and into the member 32 and serves as a guide for the spring 36. The spring 36 is under compression at all times, and while the force exerted by the spring is not sufficient to support the entire weight imposed on the corner leg assembly, the spring reduces the load on the lower main leg section 17 when the lower main leg section 17 is moved to inclined position during the lowering or subsequent raising of the bed, and thus the springs 36 in the four leg assemblies facilitate the adjusting of the height of the bed. A bushing 38 of nylon or other suitable material is secured on the upper portion of the member 32 to facilitate the sliding of the member 32 in the upper section 16, and a stop 39 at the bottom of the upper section 16 prevents the member 32 from inadvertently dropping out of the leg assembly should the entire bed section for any reason be lifted a substantial distance above the floor. The engagement of the bottom end of the spring guide tube 37 with the lower wall 35 in the member 32 limits the extent to which the member 32 can be thrust upwardly in the leg assembly when the bed is being lowered to its extreme low position.

A pair of rollers 40 (FIGS. 1, 3, 4 and 9) are mounted on the inside walls of the lower hinged main leg section 17 at such distance from the bottom of the main leg section 17 that these rollers will engage the lower ends of the pair of ramps 34 respectively when the main leg section 17 is swung into vertical position and thus swung back over the member 32. The resulting engagement of

the rollers 40 in the ramps 34, as the main leg section 17 is moved into full vertical position, causes the rollers 40 to ride up the ramps 34 and thus to raise the main leg section 17 from the floor and cause it, and therewith the entire leg assembly, to become supported entirely on the member 32 as shown in FIG. 3.

Thus when the bed is in fully raised position the wheel 20 at the bottom of each hinged lower main leg section 17 is above the floor and has no engagement with the floor and the only contact of the entire leg assembly with the floor is through the swiveling mounted caster 33 on the member 32. Similarly, when the bed is in the extreme low position as indicated by the broken lines in FIG. 1, the only contact of the leg assembly with the floor is through the caster 33. Consequently, in the fully raised or fully lowered position the bed always rests entirely on the four casters 33, and, since these are capable of swiveling as well as rotating, the bed in either of these positions is easily moved in any direction on the floor.

On the other hand, when the bed is being adjusted, from high to low position, or vice versa, the wheels 20 are also in contact with the floor. However, since the wheels 20 of one connected pair of lower main leg sections 17 and the wheels 20 of the other pair of main leg sections 17 move in opposite directions during such adjustment of the bed, any tendency of the bed to be moved by the movement of these wheels 20 on the floor is neutralized.

When the bed is lowered from maximum raised position the pairs of rollers 40 move down the respective ramps 34 while the members 32 are pushed upwardly against the force of their springs, and as the wheels 20 contact the floor with the inward swing of the main leg sections 17, part of the load on the corner leg sections is carried by the wheels 20. Since these wheels are not swively mounted there is no jarring of the bed as they encounter the floor and take over part of the load.

When the bed approaches maximum low position the members 32 reach the extent of their upward movement against the force of their springs and the entire load is transferred to the casters 33 while the wheels 20 are again raised from the floor.

Thus the adjusting of the height of the bed from one position to another occurs very smoothly and easily with no annoyance to the patient, and there is no tendency for the bed to travel on the floor while its height is being adjusted.

I claim:

1. An adjustable height bed comprising a rectangular frame having four corner leg assemblies, each leg consisting of an upper section rigidly secured to the bed frame, a lower main section in said leg assembly, hinge means connecting said lower main section to said upper section enabling said lower main section to swing in beneath said frame, an extensible supplemental lower leg member slidably mounted in said upper section and straddled by said lower main section when said lower main section is in vertical position, a spring carried in said upper section and in said extensible lower member urging said extensible lower member relatively downwardly with respect to said upper section, a freely swiveling caster on the bottom of said extensible lower member, a ground-engaging wheel carried by said lower main section, co-operating lifting means for said lower main section carried by said extensible lower member and said lower main section so arranged and positioned that when said lower main section is swung into vertical position said lower main section will ride on and be supported by said extensible lower member and said wheel will be raised off the floor, means limiting the sliding of said extensible lower member in said upper section, and means for swinging the lower main sections of the four leg assemblies in unison between vertical position and retracted position extending beneath said frame.

2. The combination set forth in claim 1 with said co-operating lifting means for said lower main section com-

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prising a pair of ramps on the opposite side walls of said extensible lower member inclined upwardly toward the corresponding end of said frame, and a pair of elements on the side walls respectively in said lower main section for engagement with said ramps when said lower main section is swung from inwardly extending position into vertical position.

3. The combination set forth in claim 1 with a rigid wheel bracket at the bottom of said lower main section, a wheel shaft on said bracket, and said ground-engaging wheel mounted on said shaft.

4. The combination set forth in claim 1 with said means for swinging the lower main sections of the four leg assemblies in unison between vertical position and retracted position including a left and right hand worm rotatively supported on said frame, a pair of nuts mounted on the

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opposite halves of said worm, means connecting each of said nuts with the pair of lower main leg sections located at the corresponding end of said frame, electrically operated means for rotating said worm, and switch means controlling said electrically operated means.

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