Oct. 1, 1963 H. R. EMRICK 3,105,246

HOSPITAL BED

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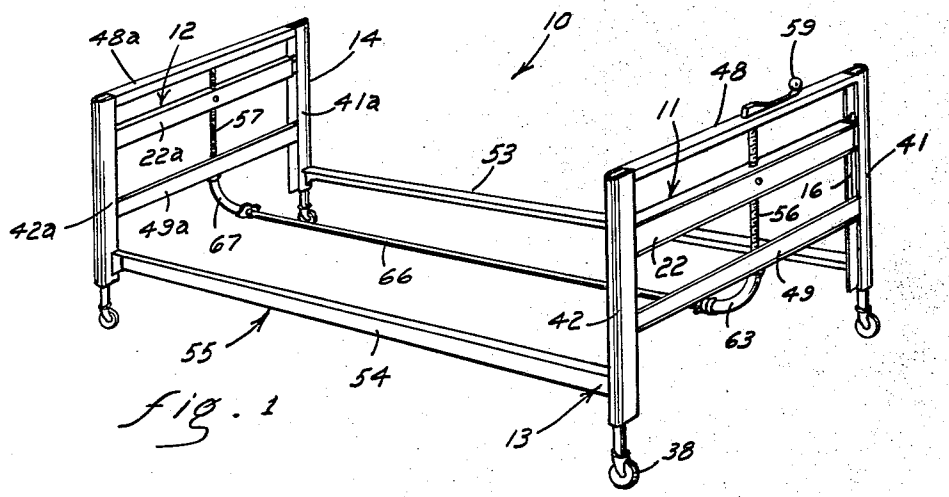


fig. 1

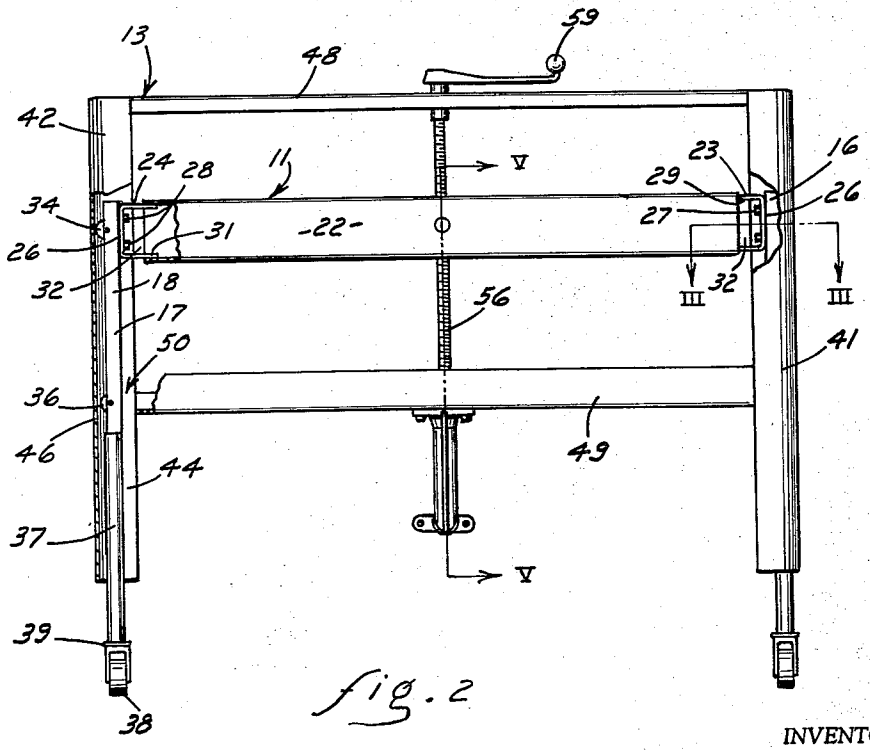


fig. 2

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HOSPITAL BED

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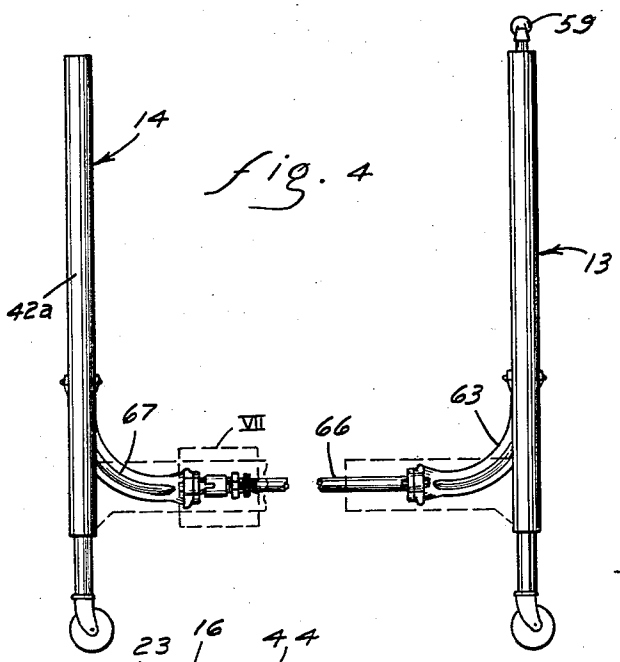


fig. 4

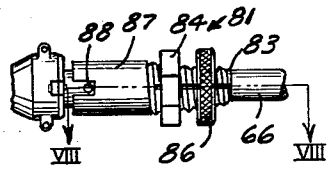
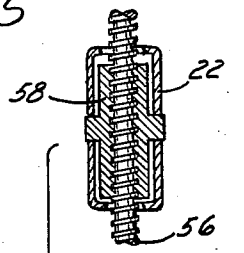


fig. 7



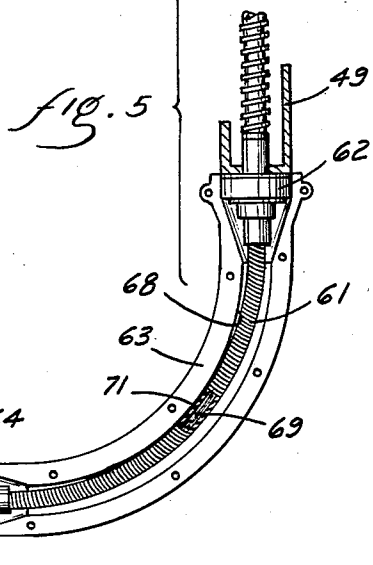


fig. 5

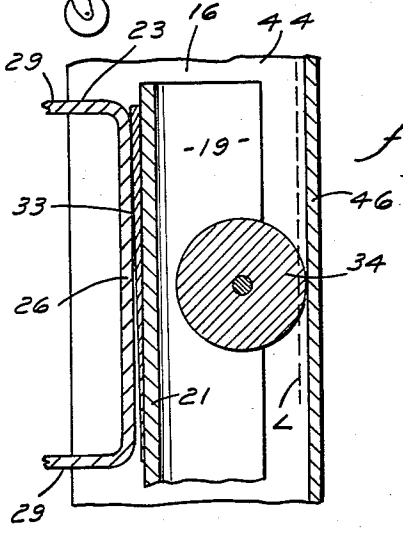


fig. 6

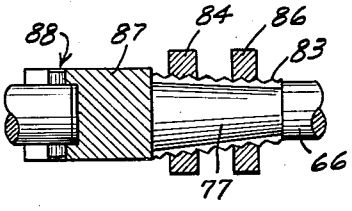


fig. 8

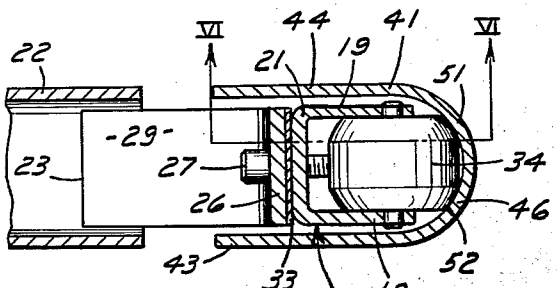


fig. 3

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United States Patent Office 3,105,246 Patented Oct. 1, 1963

3,105,246

HOSPITAL BED

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Filed Sept. 13, 1960, Ser. No. 55,646
8 Claims. (Cl. 5—63)

This invention relates to a bedframe construction, particularly for a hospital bed, which is capable of effecting vertical adjustment of the mattress supported thereby with respect to the surface, such as a floor, supporting the bedframe.

It is frequently desired that bedframes for hospital purposes and similar uses be provided with structure for adjusting the vertical position of the mattress. Although a wide variety of structures have been suggested for this purpose, they have not been completely satisfactory for several reasons. In some instances, the support mechanism for the mattress has been somewhat loosely mounted and it is free to move to a limited extent with respect to the remainder of the bedframe. This type of mounting not only creates the impression that the bed structure is flimsy, thereby giving the patient a feeling of insecurity, but also causes the bedframe to rattle. Even though such a condition may not exist when the bed is first manufactured, it may soon develop because of the rough treatment to which such beds are often subjected. Existing bedframes having vertically adjustable structures for supporting mattresses have been relatively expensive and the vertical adjustment thereof has been somewhat difficult to effect. The present invention is intended to solve the foregoing defects and others related thereto in the prior forms of vertically adjustable beds.

Accordingly, it is an object of this invention to provide an improved bedframe structure which provides for vertical adjustment of the mattress.

It is a further object of this invention to provide an improved bedframe structure, as aforesaid, in which the mattress is solidly supported and in which the possibility of the bedframe rattling, either originally or after use thereof, will be substantially eliminated.

It is a further object of this invention to provide an improved bedframe structure, as aforesaid, in which the firm and solid support of the mattress will be maintained even though the bed is subjected to rough treatment.

It is a further object of this invention to provide an improved bedframe structure, as aforesaid, which is formed of simple and durable parts and is therefore inexpensive to manufacture and requires a minimum of maintenance.

Other objects and advantages of the invention will become apparent to persons acquainted with equipment of this type upon reading the following description and inspecting the accompanying drawings.

In the drawings:

FIGURE 1 is an oblique view illustrating the improved bedframe structure to which the invention relates.

FIGURE 2 is a partially broken away, end view taken from the rightward end of FIGURE 1.

FIGURE 3 is a sectional view taken along the line III—III of FIGURE 2.

FIGURE 4 is a broken, side elevational view of the structure shown in FIGURE 1.

FIGURE 5 is a partially broken away sectional view taken along the line V—V of FIGURE 2.

FIGURE 6 is a sectional view substantially as taken along the line VI—VI of FIGURE 3.

FIGURE 7 is an enlarged view of the area indicated at VII in FIGURE 4.

FIGURE 8 is a sectional view taken on the line VIII—VIII of FIGURE 7.

General Description

In general, the invention provides a bedframe structure including a ground-engaging support having rotatable guide means, such as rollers, mounted thereon. A mattress support is provided and has surfaces which engage the guide means so that the mattress support is supported for vertical sliding movement with respect to the ground-engaging support. The ground-engaging support and the mattress support are so dimensioned that the mattress support is in a stressed condition and the surfaces engaging the rollers are continuously urged into contact with the rollers to thereby substantially eliminate any looseness in the mounting of the mattress support and thereby prevent the occurrence of any rattles, squeaks or the like.

The invention also provides an improved mechanism for raising and lowering the mattress support with respect to the ground-engaging support. This structure includes a pair of oppositely threaded screws at the opposite ends of the bed which are connected by means including flexible shaft means, whereby rotation of one of the screws effects simultaneous rotation of the other. The screws are so connected to the ground-engaging support and mattress support that rotation of the screws effects raising or lowering of the mattress support. Suitable means, such as a manually operable handle or an electric motor, are provided for the purpose of rotating one of the screws.

Detailed Description

Referring to the drawings, the invention comprises a bed structure 10 having a ground-engaging support consisting of two ground-engaging end frames 11 and 12 and a vertically moving mattress support consisting of two end structures 13 and 14 which are interconnected to support any suitable mattress and spring apparatus (not shown).

The two ground-engaging end frames 11 and 12 are identical so only end frame 11 will be described in detail herein. The corresponding parts of end frame 12 are identified with the same reference numeral with the suffix "*a*" applied thereto.

The end frame 11 (FIGURE 2) comprises a pair of substantially channel-shaped posts 16 and 17, each of which has a pair of legs 18 and 19 connected by a web 21 (FIGURE 3). The channels comprising posts 16 and 17 open in opposite directions. A substantially square, tubular connecting member 22 extends between the posts 16 and 17 adjacent their upper ends. The ends of member 22 are rigidly connected to the webs of posts 16 and 17 by channel-shaped brackets 23 and 24. The webs 26 of brackets 23 and 24 are secured to the webs 21 of posts 16 and 17 by suitable means, such as machine screws 27 and 28 (FIGURE 2). The legs 29 and 31 of brackets 23 and 24 extend partway into the tubular member 22 and are secured thereto in any suitable manner, such as by welding. The webs 26 are spaced from the ends of the tubular member 22 to provide a clearance space 32 into which a tool may be extended for manipulating the screws 27 and 28. A wedge-shaped shim 33 (FIGURE 3) may be provided, if desired, between the webs 21 and 26 to adjust the distance between the two webs of the posts 16 and 17 for purposes to be described in greater detail hereinbelow.

A pair of rollers 34 and 36 (FIGURE 2) are rotatably supported by and located between the legs 18 and 19 of the posts 16 and 17 adjacent the upper and lower ends thereof, respectively. The peripheries of the rollers 34 and 36 extend beyond the free ends of legs 18 and 19. Each of the posts 16 and 17 has a post 37 (FIGURE 2) secured to the lower end thereof, as by welding, and said post 37 has a ground-engaging wheel 38 mounted thereon, ordinarily by means including a swivel caster 39 of any suitable type.

The mattress-supporting end structures 13 and 14 are identical and, therefore, only end structure 13 will be described in detail herein. Corresponding parts on the other end structure 14 are identified by the same reference numeral with the suffix "*a*" applied thereto.

The end structure 13 includes a pair of substantially U-shaped columns 41 and 42 which are of a length somewhat greater than the length of the posts 16 and 17. The columns 41 and 42 each comprise a pair of legs 43 and 44 (FIGURE 3), which are parallel with the legs 18 and 19 of the posts 16 and 17 and a bight 46 which is opposed to the web 21. The columns 41 and 42 fit around the posts 16 and 17, respectively, and the bight 46 contacts the peripheries of the rollers 34 and 36 as shown in FIGURE 3 so that the columns are supported for vertical movement with respect to the posts 16 and 17.

The columns 41 and 42 are connected at their upper ends by an upper crossbar 48 and connected intermediate their ends by a lower crossbar 49. The crossbars 48 and 49 are secured to columns 41 and 42 in any suitable manner, such as by welding. A space 50 (FIGURE 2) is provided between the ends of crossbar 49 and the bights 46 of columns 41 and 42 and the posts 16 and 17 extend therethrough.

The lengths of the crossbars 48 and 49 and the depth of columns 41 and 42 are such with respect to the length of member 22, the depth of posts 16 and 17 and the size of the rollers 34 and 36 that the inner surfaces of the bights 46 of columns 41 and 42 are spaced apart a slightly lesser distance than the portions of the rollers 34 and 36 which they engage, when the mattress support is not mounted on the end frame 11. Thus, when the end structure 13 is mounted on the end frame 11, the columns 41 and 42 are sprung apart slightly and thereby placed under tension which continuously urges the bights 46 toward each other and into snug engagement with the peripheries of rollers 34 and 36. This structure effectively prevents any looseness of the structure or tendency for it to rattle. More specifically, and as shown in FIGURE 6, the length of the crossbars 48 and 49 and the depth of columns 41 and 42 are such that the portions of the inner surface of bight 46 which engage the rollers 34 and 36 lie substantially along a broken line L when the end structures 13 and 14 are in their unmounted, unstressed condition. When the end structures 13 and 14 are mounted on the ground-engaging end frames 11 and 12, the inner surface of the bight 46 is moved outwardly to the solid line position and this effects a stressing of the end structures 13 and 14.

As shown in FIGURE 3, the rollers 34 and 36 each contact the bight 46 at two spaced zones 51 and 52 and this prevents any movement of the columns 41 and 42 in a direction parallel with the axis of each roller. As wear of the rollers 34 and 36 occurs, such wear is taken up by a reduction in the outward distortion of the bights 46. Thus, wear of the rollers will not destroy the firm connection provided by tensioning the mattress-supporting end structure.

A spring and mattress apparatus 55 of any suitable type is mounted on and extends between and connects the mattress-supporting end structures 13 and 14. For purposes of simplifying the disclosure, this spring and mattress apparatus is not disclosed in detail therein since it may be of any suitable type and is not a part of the invention. The spring and mattress apparatus is here schematically shown as including two members 53 and 54 which extend between and are mounted on the columns 41, 41*a* and 42, 42*a* respectively.

A screw 56 extends between and is rotatably, but axially non-movably, mounted upon crossbars 48 and 49. The screw 56 is threaded through a self aligning nut 58 (FIGURE 5) which is located within and is pivotally supported by the member 22. Another screw 57 (FIGURE 1) is similarly mounted upon the end frame 12 and end structure 14. The screws are oppositely threaded but are otherwise identical. It has been found desirable to form the screws 56 and 57 so that they have a lead of 0.2 inch so that they cause the nuts 58, and thereby the end structures 13 and 14, to be moved vertically one inch for each five revolutions of the screws. Thus, upon rotation of the screws 56 and 57, the mattress-supporting end structures 13 and 14 will be raised or lowered, depending upon the direction of rotation of the screws. The two screws are connected by means to be described in greater detail hereinbelow so that rotation of one thereof effects simultaneous rotation of the other. This, due to the opposite threading of the screws, will cause simultaneous raising and lowering movement of the end structures 13 and 14 with respect to the end frames 11 and 12.

A handle 59 is here shown as connected to the screw 56 whereby manual operation of the handle will effect simultaneous rotation of the screws 56 and 57. Other means, such as an electric motor, may be provided for effecting rotation of the screws, if desired.

Referring to FIGURE 5, the structure for connecting the screw 56 to screw 57 includes a flexible shaft 61 which is connected at one end by a coupling and bearing unit 62 of any suitable type to the end of screw 56 in such fashion that the shaft 61 rotates with said screw. The shaft 61 extends through an arcuate, split casing 63 and is connected by another coupling and bearing unit 64 of any suitable type to a rod 66. The rod 66 extends substantially the entire length of the bed assembly and the other end thereof is connected to another flexible shaft mounted in an arcuate casing 67 in the same manner as shaft 61, previously described. The other end of the flexible shaft in casing 67 is connected to the lower end of screw 57. Casings 63 and 67 are mounted upon crossbars 49 and 49*a*, respectively.

It will be observed that the flexible shaft 61 contacts the internal wall 68 of casing 63 along a substantial portion of the arcuate extent thereof. This contact imposes a frictional force on shaft 61 which restrains but does not prevent rotation thereof. This insures that the screws 56 and 57 will be rotated only by operation of the handle 59.

Desirably, the flexible shaft 61 comprises a core 69 which is closely surrounded by a spirally wound metal sheath 71 (FIGURE 5), both the core and the sheath being rotatable together. With this type of construction, the sheath 71 might expand somewhat when the torque exerted thereon is in a direction opposite to that in which it is wound. In order to prevent one or the other of the sheaths of the two shafts from thus expanding and seizing upon the walls of the casings 63 and 67, it has been found desirable that the sheaths be wound in the same band as the threads of the screws to which they are respectively connected.

While not essential to the operation of the device, the bed will be substantially improved by the insertion of a slip clutch 81 at an appropriate point between the screws 56 and 57 of the apparatus, preferably between the cable guides 63 and 67 as shown in FIGURE 4.

While this slip clutch may be any of many forms, a particularly simple and effective design appears in FIGURES 7 and 8. This includes a rod 66 having an inwardly tapered portion 77 provided thereon which portion is engaged by the collet jaws 83. Said collet jaws are controlled by a nut 84, preferably in association with the lock nut 86. A coupling 87, here comprising a slot and pin combination 88, connect the rod 66 with the flexible cable within the casing 67. The pressure between the collet jaws 83 and the shaft 66 is adjusted in the usual manner by suitable positioning of the nut 84 and the lock nut 86.

Operation

While the assembly and operation of the device has been indicated somewhat above, the same will be briefly described to insure a complete understanding of the invention. The mattress-supporting end structures 13 and 14

are mounted on the ground-engaging end frames **11** and **12** by springing the lower ends of the columns **41**, **42** and **41***a*, **42***a* apart slightly and then sliding said columns downwardly over the posts **16**, **17** and **16***a*, **17***a*. This, as described above, will effect a slight stressing of the end structures **13** and **14**, urging the columns **41**, **42** toward each other so that they will be urged into contact with the periphery of rollers **34** and **36**. If it should be observed that there is not a sufficiently tight contact between the rollers and the bights **46** of the columns **41** and **42**, such may be adjusted by loosening the screws **27** and **28** and urging the wedge-shaped shims **33** downwardly in order to increase the spacing between the webs **21** of the posts **16** and **17**. Since only a slight springing apart of the columns **41** and **42** is necessary in order to effect the desired stressing of the mattress-supporting end structures, it will be apparent that only slight differences in dimension are required. With the mattress-supporting end structures **13** and **14** mounted upon the ground-engaging end frames **11** and **12**, respectively, the mattress and spring apparatus **55** may be mounted upon the end structures **13** and **14** in any suitable manner. The bed will then be ready for use.

When it is desired to adjust the vertical position of the mattress and spring apparatus **55**, such is effected by rotating the handle **59** in the appropriate direction to thereby effect simultaneous rotation of the screws **56** and **57**. Due to the mechanical advantage provided by the use of the screw and the handle, such vertical adjustment of the mattress and spring structure can be effected easily. Due to the stressing of the end structures **13** and **14**, the bed structure provides a firm support for the mattress. Further, rattling of the parts thereof is substantially eliminated and this is maintained even though the bed is subjected to rough usage.

The frictional contact provided by the shaft **61** contacting the internal wall **68** of the casing **63** and the corresponding engagement between the other shaft and casing **67** creates a light frictional force which tends to resist rotation of the screws **56** and **57**. The threaded engagement between the screws **56** and **57** and their nuts also provides a resistance to rotation of said screws. Thus, the mattress will remain in whatever position it is placed until such time as the attendant wishes to adjust the position thereof. Such frictional contact does not significantly increase the force required to effect rotation of the screws **56** and **57** but serves to prevent any unintended rotation thereof.

The slip clutch **81**, where used, will protect the flexible cables from damage, particularly where the screw **56** is driven by a motor, in the event that the opposite end of the bed becomes stuck or jammed in some manner. Further, when the beds are assembled, if one end thereof is higher than the other, it is a simple matter to align same to identical vertical positions merely by running both ends of the bed up or down against suitable stops and the parts will automatically provide their own vertical alignment. Where such clutch is omitted, as it may be without departing from the broader concepts of the invention, it is important that each end of the bed be placed as nearly as possible into identical vertical positions before the connection is made between the screws **56** and **57**.

While a particular preferred embodiment of the invention has been described, the invention contemplates such changes or modifications therein as lie within the scope of the appended claims.

What is claimed is:

1. A bed construction comprising:

a substantially rectangular, ground-engaging support including four support posts at the corners thereof, a transversely extending member between the pairs of posts at each end of said frame and rigidly connecting same;

guide roller means rotatably mounted on each of said posts and extending sidewardly therefrom, the guide roller means on the posts at each end of said ground-engaging support being parallel and substantially aligned in a vertical plane;

a mattress support including two pairs of upright columns, each pair of columns being associated with a pair of said posts;

a pair of vertically spaced, transversely-extending bars extending between and rigidly connecting each pair of columns, said bars being located, respectively, above and below said transversely extending member;

each said pair of columns having opposed surfaces located outwardly of said posts and engaging the peripheries of said roller means on the pair of posts with which they are associated;

a pair of oppositely threaded members, one member being provided for each pair of columns and being rotatably but axially nonmovably mounted in and extending between said bars;

a nut in each transversely extending member, said threaded member threadedly engaging the respective nuts so that rotation of said threaded members will effect vertical movement of said mattress support with respect to said ground-engaging support;

and means rigidly and directly connected to the lower ends of said threaded members for effecting simultaneous rotation of said threaded members.

2. A bed construction according to claim 1 wherein said columns are substantially U-shaped in cross section with the bights of the columns of each pair facing each other and with the rollers contacting said bights.

3. A bed construction according to claim 1 wherein said means connecting said threaded members includes an arcuate flexible shaft connected to the lower end of each threaded member and extending therefrom toward the other threaded member; and a rigid bar connected to and extending between the adjacent ends of said flexible shafts.

4. A bed construction according to claim 3 including a pair of arcuate tubes mounted on the lowermost ones of said bars at the respective ends of said mattress support, said flexible shafts extending respectively through said tubes and lightly frictionally engaging the internal walls thereof so that rotation of said shafts and thereby said threaded members is lightly restrained.

5. A bed construction according to claim 4 wherein said flexible shafts each include a core and a spirally wound metal sheath and the sheaths are wound in the same direction as the threaded members to which they are respectively attached.

6. A bed construction according to claim 4 including also a slip clutch interposed between said pair of oppositely threaded members.

7. A bed, comprising:

two ground-engaging, substantially rectangular, end frames, each end frame being comprised of a pair of spaced apart, vertical posts;

a connecting member extending between and connecting said posts toward the upper end thereof;

a pair of mattress-supporting end structures each associated with one of said end frames, each end structure being comprised of a pair of vertical columns mounted on said posts for vertical movement with respect thereto;

a pair of substantially parallel crossbars extending between and secured to said columns of each end structure, said crossbars being located respectively above and below, and substantially parallel to, the connecting member of the end frame associated therewith;

a pair of oppositely threaded, vertically disposed screws rotatably mounted on and extending between the crossbars of the respective end structures;

a nut mounted in each of said connecting members and threadedly engaging the screw of the associated end structure;

a pair of arcuate tubes secured at their upper ends to the lower crossbar of said end structures, said tubes being curved toward each other so that their lower ends are aligned with each other;

a pair of coupling and bearing units mounted in each of said arcuate tubes adjacent the upper and lower ends thereof, respectively, the lower ends of the screws being connected to the coupling and bearing units at the upper ends of the arcuate tubes;

a flexible shaft secured to and extending between the coupling and bearing units in each arcuate tube whereby said flexible shafts rotate with said screws;

an elongated, rigid bar extending between and into the lower ends of said arcuate tubes, said bar being connected to said coupling and bearing units in said lower ends of said tubes for simultaneous rotation with said flexible shafts and being held against movement, other than rotational, with respect to said tubes.

8. A bed, comprising: two, ground-engaging, substantially rectangular end frames, each end frame being comprised of a pair of vertically disposed, substantially channel-shaped posts, the webs of said posts being opposed and the legs thereof extending in opposite directions; a connecting member extending between and connected to the upper ends of said posts, a plurality of vertically spaced rollers rotatably mounted on and located between the legs of each post and extending outwardly beyond the ends thereof; a pair of mattress-supporting end structures each associated with one of said end frames, each end structure being comprised of a pair of vertically disposed, substantially U-shaped columns, said columns opening toward each other and each thereof being located

outwardly from and opposed to one of said posts with the rollers on said posts engaging the bights of said columns, a pair of cross bars extending between and secured to said columns at the upper ends thereof and at a point between the ends thereof, respectively; a pair of vertically disposed screws rotatably mounted within and extending between the cross bars of the respective end structures; a nut mounted in each of said connecting members and threadedly engaging the screw in the associated end structure; and means including flexible shaft means rigidly secured to and extending between the lower ends of said screws for causing same to rotate together.

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