

[54] **TILTING BED**
 [75] Inventor: **George Kenneth Jameson**, Skerries, Ireland
 [73] Assignee: **Medwil Limited**, Galway, Ireland
 [22] Filed: **Apr. 16, 1974**
 [21] Appl. No.: **461,358**

2,808,828 10/1957 Rubin 128/33
 2,827,894 3/1958 Meyers..... 128/25 R
 2,907,323 10/1959 Ritter..... 128/33
 3,207,152 9/1965 Thornton..... 128/33

Primary Examiner—Lawrence W. Trapp
 Attorney, Agent, or Firm—Diller, Brown, Ramik & Wight

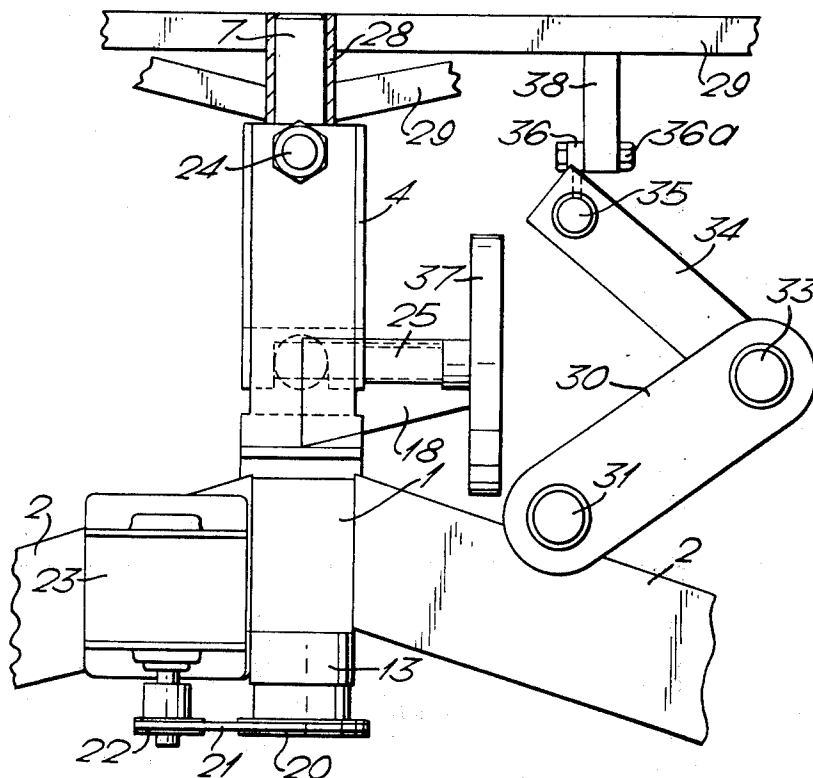
[30] **Foreign Application Priority Data**
 Apr. 16, 1973 Ireland..... 596/73
 [52] U.S. Cl..... 128/24 R; 128/33; 128/46
 [51] Int. Cl.²..... A61H 1/00
 [58] Field of Search..... 128/24 R, 25 R, 33, 46, 128/25 B

[57] **ABSTRACT**

A bed, which invention relates to a construction of bed, which is primarily for hospital use, in which the mattress supporting framework is subjected to a rhythmic tilting under the influence of a drive from an electric motor transmitted through an articulated shaft having an upper shaft member and a lower shaft member which are not vertically aligned for rhythmic tilting of the mattress support framework, the mattress support framework and the base framework of the bed being interconnected to prevent any rotational movement of the mattress support framework.

[56] **References Cited**
UNITED STATES PATENTS
 1,602,196 10/1926 Iverson 128/33
 2,246,689 6/1941 Kost 128/25 R
 2,707,465 5/1955 Nemeth..... 128/25 R

13 Claims, 16 Drawing Figures



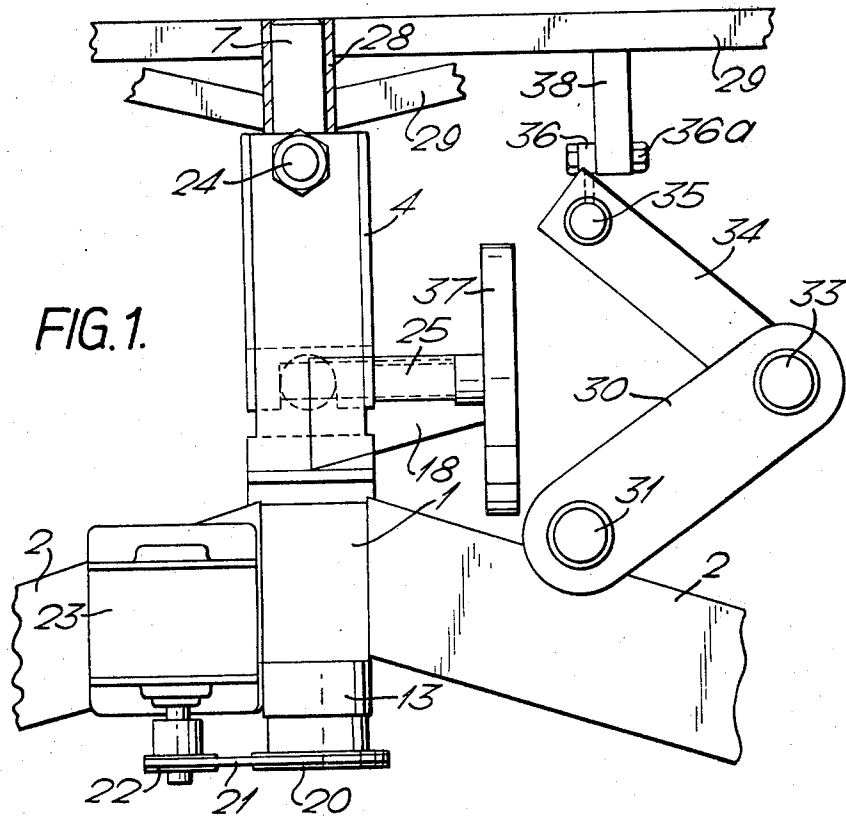


FIG. 1.

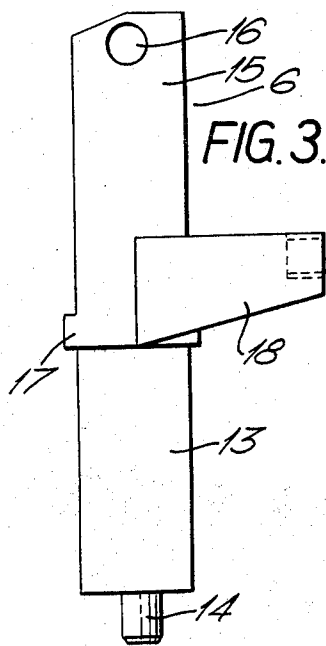


FIG. 3.

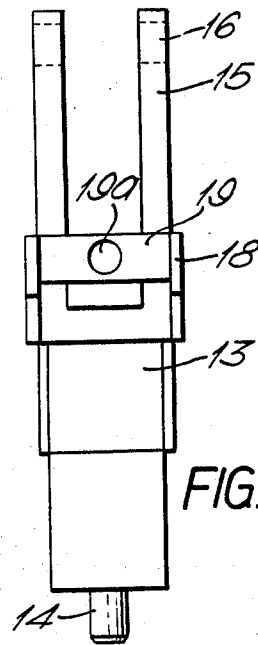


FIG. 4.

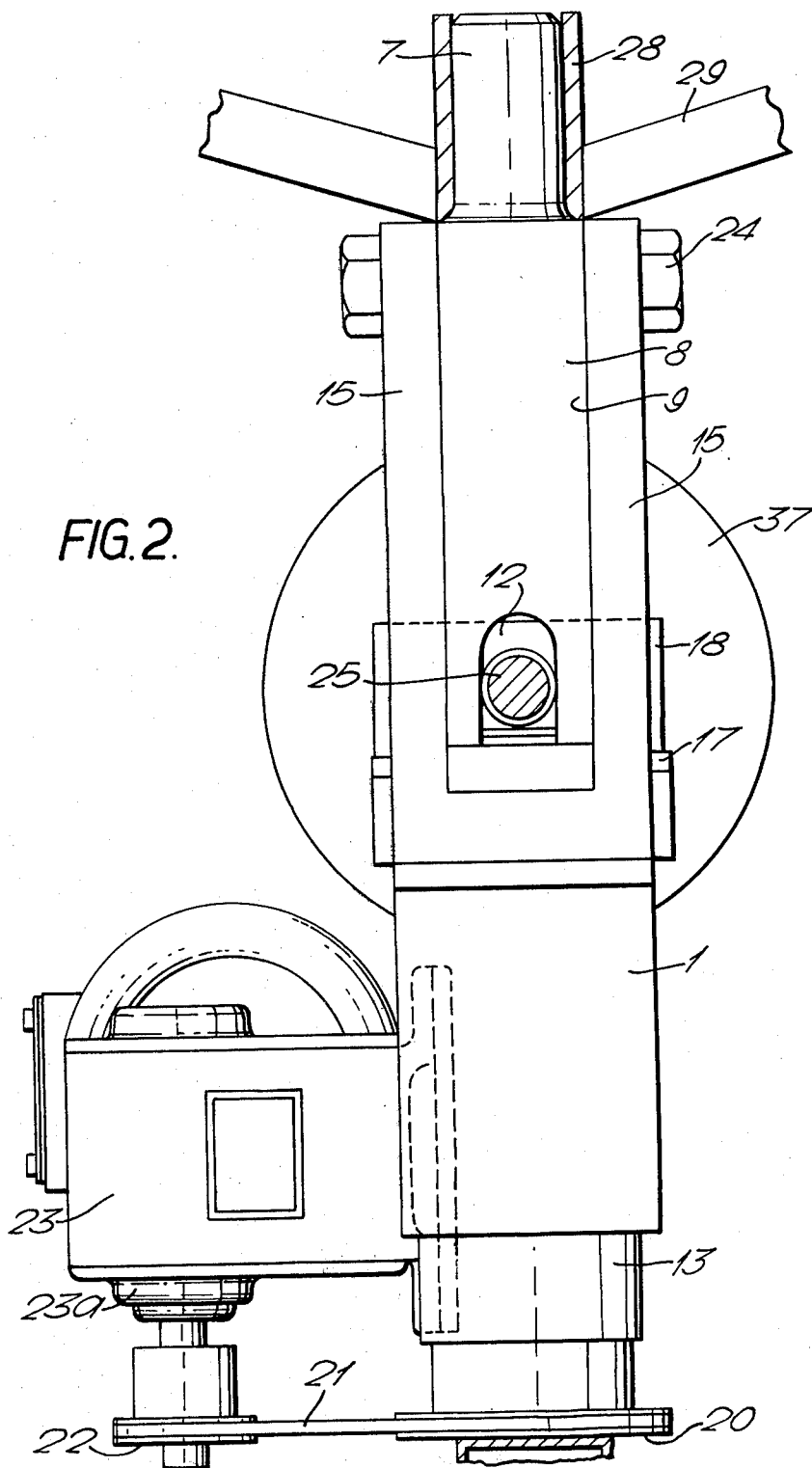


FIG. 2.

FIG. 5.

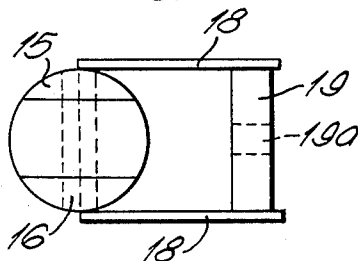


FIG. 6.

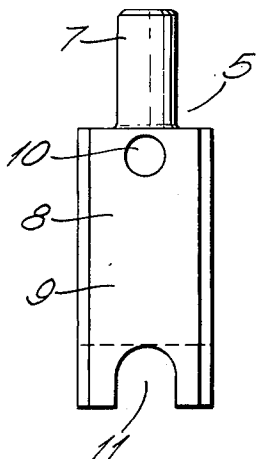


FIG. 7.

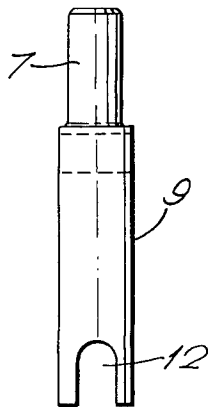


FIG. 8.

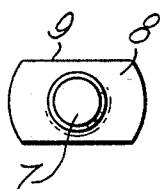


FIG. 9.

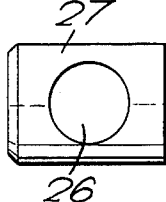


FIG. 10.

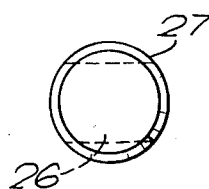
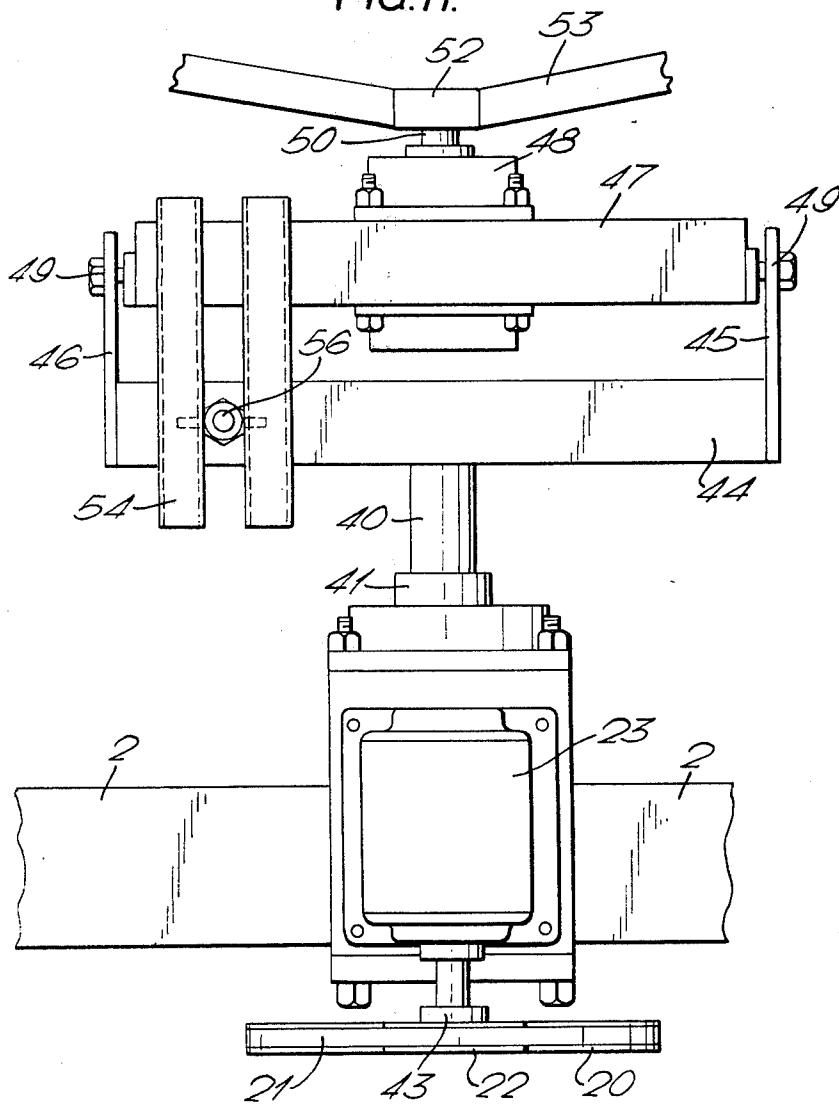


FIG. 11.



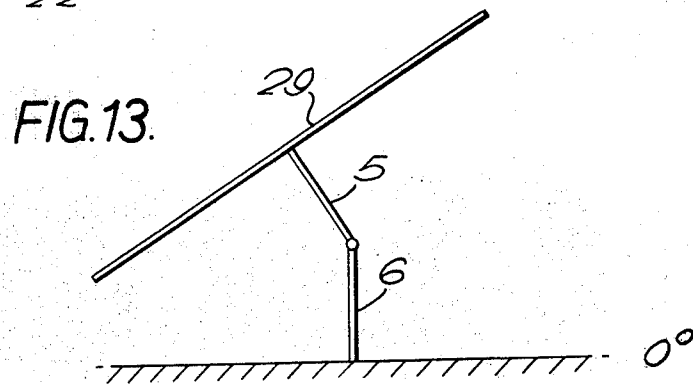
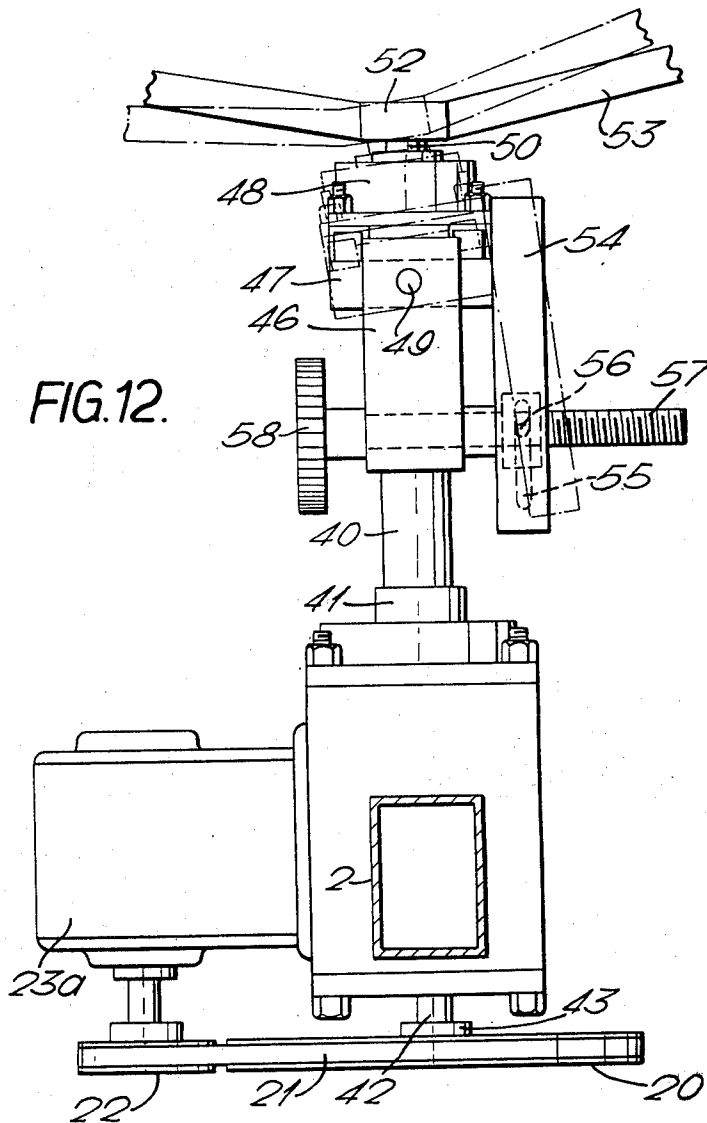


FIG. 14.

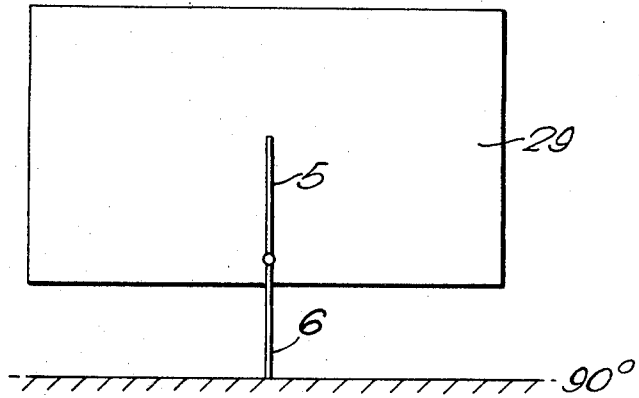


FIG. 15.

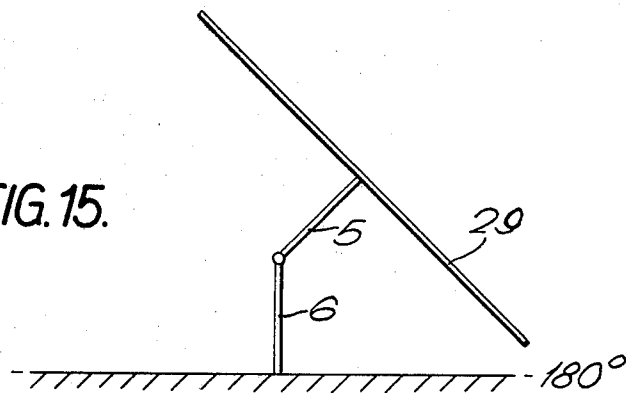
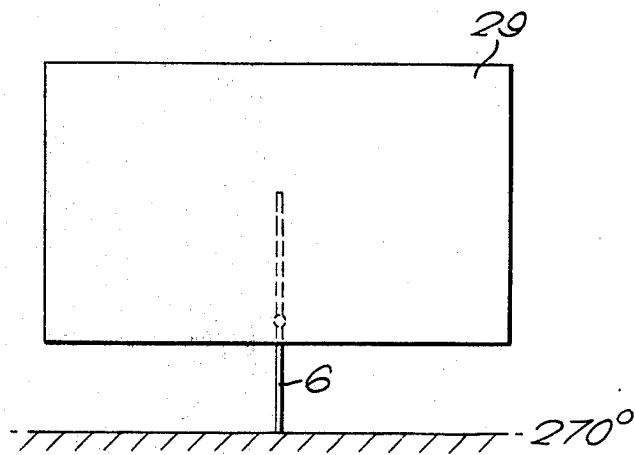


FIG. 16.



TILTING BED

The present invention relates to a construction of bed and in particular to a construction of bed for hospital use, the said bed being adapted for controlled rhythmic tilting. The bed is intended for use by acute and chronic patients such as paraplegics, persons suffering from multiplesclerosis, from a fractured spine, or from similar serious injuries or illness which either renders the patient incapable of voluntary movement or necessitates restriction of his movements. It will be readily appreciated that hospital cases of the above mentioned nature require a great deal of skilled nursing care. It will be further appreciated that to obviate the formation of bed sores on the patient, it is necessary that the patient change position in the bed to change the points of pressure on the patient's body. It has been found in practice that the patients position should be changed as a matter of routine, approximately every 3 hours and the changing of the patients position must be carried out with the greatest of care and skill and involves a number of skilled personnel. It has also been found that the postural change of the patient results in a reduction of venous thrombosis and postural drainage.

There are known a number of constructions of bed for hospital use in which the mattress supporting surface or stretcher is mounted for controlled oscillation in order to subject the patient to gentle changes in position while lying on the bed. The oscillatory movement may in fact be either continuous or intermittent but invariably the movement is a transverse movement about a central longitudinal axis of the mattress supporting surface or stretcher. The extent of the oscillatory movement is in most cases adjustable and in certain constructions of bed, a complete rotation of the mattress supporting surface or stretcher through 360° is possible — the patient being of course in such cases, held or strapped into position on the bed. It is also known to provide a construction of hospital bed in which oscillation or tipping about a transverse axis is in addition possible to the transverse oscillatory movement about the central longitudinal axis of the mattress supporting surface or stretcher.

In the constructions of bed mentioned it has invariably been found necessary to provide clamping means to prevent movement of the patient in the bed. In many cases the patient is more or less totally encased within the bed structure. It can be readily appreciated that such an experience is not conducive to the morale of the patient and can, it is suggested, retard the progress of the patient.

It is an object of the present invention to provide a construction of bed which does not per se oscillate about either a longitudinal axis or indeed a transverse axis, but rather a construction of bed in which a controlled rhythmic tilting of the bed is achieved, the tilting movement being very slow but quite sufficient to continuously change throughout a cycle, the pressure points on the patient's body. Further, the construction of bed of the present invention does not envisage the use of any elaborate restraining devices to maintain the patient in position. It has been found that it is quite adequate to provide low padded side walls on the mattress supporting structure.

The present invention provides a bed adapted for controlled rhythmic tilting comprising a base framework, an articulated support shaft, having an upper

shaft member and a lower shaft member pivotally connected together, the lower shaft member being rotatably mounted on the base framework, means for rotating the support shaft relative to the base framework, means for tilting the upper shaft member relative to the lower shaft member, a mattress support framework rotatably mounted on the upper shaft member and means interconnecting the mattress support framework and the base framework to prevent a horizontal rotational movement of the mattress support framework relative to the base framework. Preferably, the end of the lower shaft member connected to the upper shaft member is bifurcated, the upper shaft member being pivotally mounted on the said bifurcated ends of the lower shaft member. Further, the bifurcated ends of the lower shaft member are preferably bridged by a frame member in which the upper shaft member is rotatably mounted, the mounting being such as to allow pivotal movement between the upper and lower shaft members.

The invention will be clearly understood from the following description of two embodiments thereof given by way of example only with reference to the accompanying drawings in which:

FIG. 1 is a side cross-sectional and partially cutaway view of one embodiment of the bed according to the invention,

FIG. 2 is a partially cut-way and sectional end view of the bed illustrated in FIG. 1,

FIG. 3 is a detailed side view on a reduced scale of a lower shaft portion of the bed illustrated in FIG. 1,

FIG. 4 is an end view of the lower shaft portion,

FIG. 5 is a plan view of the lower shaft portion,

FIG. 6 is a side view again on a reduced scale of an upper shaft portion of the bed illustrated in FIG. 1,

FIG. 7 is an end view of the lower shaft portion,

FIG. 8 is a plan view of the lower shaft portion,

FIG. 9 is a side view of a nut member forming part of the bed,

FIG. 10 is an end view of the nut member of FIG. 9,

FIG. 11 is a side cross-sectional and partially cut away view of a second embodiment of the bed according to the invention,

FIG. 12 is a sectional end view of the bed illustrated in FIG. 11,

FIG. 13 is a diagrammatic view of the bed in one position,

FIG. 14 is a diagrammatic view of the bed in another position,

FIG. 15 is a diagrammatic view of the bed in a further position, and

FIG. 16 is a diagrammatic view of the bed in a still further position.

Referring to FIGS. 1-10 of the accompanying drawings there is provided a bed comprising a base framework 1 having four splayed legs 2, with castors (not shown) of conventional construction provided on the extremity of each leg 2. An articulated support shaft, indicated generally by the reference numeral 4, is mounted on the base framework 1. The support shaft 4 comprises an upper shaft member 5 and a lower shaft member 6.

The upper shaft member 5 comprises a stub axle 7 mounted on a shaft 8 having two parallel faces 9. A hole 10 and a slot 11 project through the faces 9 and a further slot 12 which is at right angles to the slot 11 is also provided.

The lower shaft member 6 comprises a cylindrical shaft 13 having at one end a stub axle 14 and bifurcated at the other end into a pair of furcations 15, each furcation 15 having a hole 16 therein. Further the cylindrical shaft 13 is formed with a collar 17 thereon, while on each furcation 15 there is mounted a support plate 18, the two support plates 18 being bridged by a cross-bar 19 with a hole 19a therein. The lower shaft member 6 is rotatably mounted within the base framework 1 and the stub axle 14 of the shaft 13 has fixedly mounted thereon a drive pulley 20 operatively connected to an electric motor 23, which is mounted on one of the legs 2, through a belt drive over a second drive pulley 22 mounted on the output shaft of a gearbox 23a connected to the output of the electric motor 23.

A pivot member 24, formed from a high tensile nut and bolt, projects through the holes 10 and 16 to pivotally connect the upper shaft member 5 and the lower shaft member 6. A threaded bar 25 operated by a turnwheel 37 rotatably mounted on the cross-bar 19 engages the hole 19a in the cross-bar 19 and projects beneath the slot 11 in the upper shaft portion 5. The bar 25 engages a threaded hole 26 in a nut member 27, held within the slot 12: the member 27 is of substantially cylindrical shape (see FIGS. 9 and 10). The stub axle 7 of the upper shaft member 5 is rotatably mounted within a cylindrical bearing 28 mounted within a mattress support framework 29.

Means interconnecting the mattress support framework 29 and the base framework 1 are provided to prevent rotation of the mattress support framework 29 relative to the base framework 1. This means comprises a bar 30 pivotally mounted at 31 on one of the legs 2 and at its other end at 33 to a further bar 34 which is in turn pivotally mounted at 35 on a depending lug 36 which is, in turn pivotally mounted by a bolt 37 on a lug 38 fixed to the mattress support framework 29. It is important to note that in order to prevent any degree of slewing of the mattress support framework the pivot point 35 is in the same horizontal plane as the pivot member 24. Accordingly the length of the lug 36 is determined by the necessity to position the pivot point 35 correctly.

In this embodiment, in operation the electric motor 23 and associated gearbox 23a cause the support shaft 4 to rotate. When the upper shaft member 5 and the lower shaft member 6 are in vertical alignment the articulated shaft rotates with the stub axle 7 rotating freely within the cylindrical bearing 28 of the mattress support framework 29. Any rotational tendency imparted to the mattress support framework 29 is constrained by the mattress support framework-base framework interconnecting means 30, 31, 33, 34, 35 and 36.

If the turnwheel 37 is rotated to move the threaded bar 25 in the nut member 27, the upper shaft member 5 will be pivoted relative to the lower shaft member 6, with consequent tilting of the mattress support framework 29. The lower shaft member 6 and the upper shaft member 5 are no longer vertically aligned and rotational movement of the mattress support framework under the indirect influence of the electric motor 23 is still constrained by the interconnecting means 30, 31, 33, 34, 35 and 36, so that the mattress support framework describes rhythmic tilting action as diagrammatically illustrated in FIGS. 13 - 16 inclusive of the accompanying drawings. The cycle time for a complete

tilting cycle is approximately 15 minutes. The articulated shaft 4 rotates at approximately 0.06 rpm.

Referring to FIGS. 11 and 12 of the accompanying drawings the second embodiment of the invention is shown. The lower shaft member 40 again comprises a cylindrical shaft mounted in bearings 41. The end 42 of the lower shaft member being connected to a drive pulley 43, which is operatively connected to an electric motor in the same manner as described in the first embodiment. The lower shaft member 40 has a bifurcated end formed by a bar 44 with plates 45, 46. A frame member 47 having a bearing 48 is pivotally mounted at 49 between the plates 45, 46. The frame member 47 forms the connecting end of the upper shaft member 50, in that the end of the upper shaft member 50 is rotatably mounted in the bearing 48. The other end 51 of the upper shaft member 50 is rotatably mounted within the bearing 52 of the mattress support framework 53.

In this embodiment the frame member 47 carries support arms 54 having slots 55 which carry a nut member 56. A threaded bar 57 having a turnwheel 58 is passed through a hole 59 in the bar 44 to engage the nut member 56. Rotation of the turnwheel 58 with consequent relative movement between the threaded bar 57 and the nut member 56 causes the upper shaft member 50 to pivot on the frame member 47, relative to the lower frame member 40. The length of each slot 55 is sufficient to allow of controlled movement of the nut member 56 to facilitate correct tilting of the mattress support framework 53.

In this embodiment the same means as described in relation to the first embodiment are used interconnecting the mattress support framework and the base framework to prevent rotational movement of the mattress support framework relative to the base framework.

The operation of the second embodiment of the invention is basically the same as the method of operation described in relation to the first embodiment. The rhythmic tilting of the bed of this second embodiment is again as illustrated in FIGS. 13 - 16 inclusive of the accompanying drawings.

I claim:

1. A bed adapted for controlled rhythmic tilting comprising:
 - a base framework,
 - an articulated support shaft including an upper shaft member, a lower shaft member and means pivotally connecting the upper and lower shaft members together for rotation as a unit, means rotatably mounting the lower shaft member on the base framework for rotation about a fixed axis, means connected to the support shaft for rotating the support shaft relative to the base framework, means for tilting the upper shaft member relative to the lower shaft member,
 - a mattress support framework supported on the upper shaft member for rotation relative to the support shaft, and
 - means interconnecting the mattress support framework and the base framework for preventing rotational movement of the mattress support framework relative to the base framework while permitting tilting movement of the mattress support framework relative to the base framework.
2. A bed as claimed in claim 1 in which the means pivotally connecting together the upper and lower shaft

members include the end of the lower shaft member connected to the upper shaft member being in the form of bifurcated ends, and the upper shaft member being pivotally mounted on the bifurcated ends.

3. A bed as claimed in claim 2 in which the upper shaft member includes a frame member which bridges the bifurcated ends of the lower shaft member and a shaft rotatably supported by the frame member.

4. A bed as claimed in claim 1 in which the means for tilting the upper shaft member relative to the lower shaft member comprises a threaded bar rotatably mounted on the lower shaft member and in screw thread engagement with a nut member secured to the upper shaft member remote from the means pivotally connecting together the upper and lower shaft members whereby rotation of the threaded bar causes relative movement between the nut member and the threaded bar to pivot the upper shaft member relative to the lower shaft member.

5. A bed as claimed in claim 1 in which the means interconnecting the mattress support framework and the base framework to prevent a horizontal rotational movement of the mattress support framework relative to the base framework comprises a first bar pivotally attached at one end to the mattress support framework and at the other end to a second bar which is itself pivotally mounted on the base framework.

6. A bed as claimed in claim 5 in which the pivotal attachment of the first bar to the mattress support framework is through the pivotal mounting of the bar on a pivot member secured to the mattress support framework, the pivot member having an axis lying in a common plane with the means pivotally connecting together the upper shaft member and the lower shaft member.

7. A bed as claimed in claim 5 in which the pivotal attachment of the first bar to the mattress support framework is through the pivotal mounting of the bar on a pivot member secured to the mattress support framework, the pivot member having an axis lying in a common plane with the means pivotally connecting together the upper shaft member and the lower shaft member, the means pivotally connecting together the upper and lower shaft members defining a pivot axis rotatable in said common plane.

8. A bed particularly constructed for controlled rhythmic tilting, said bed comprising a base framework, an articulated support shaft including an upper shaft member and a lower shaft member, means carried by said base framework supporting said lower shaft member for rotation about a fixed axis, said lower shaft member having a bifurcated upper portion and said upper shaft member having a lower portion positioned within said bifurcated upper portion, horizontal pivot means carried by an upper part of said bifurcated upper portion mounting said upper shaft member above a lower end thereof for pivoting relative to said lower shaft member, cooperating adjustable tilting means on the lower end of said upper shaft member and generally at the lower end of said bifurcated upper portion for fixedly adjusting the tilting of said upper shaft member relative to said lower shaft member, said upper shaft member including an upper shaft, a mattress support framework, means carried by said mattress support framework mounting said mattress support framework

on said upper shaft for relative rotation, means interconnecting said mattress support framework and said base framework for preventing rotational movement of said mattress support framework while permitting tilting thereof relative to said base framework, and drive means connected to said support drive for rotating said support shaft to effect rhythmic tilting of said mattress support framework.

9. A bed as claimed in claim 8 in which the means interconnecting the mattress support framework and the base framework to prevent a horizontal rotational movement of the mattress support framework relative to the base framework comprises a first bar pivotally attached at one end to the mattress support framework and at the other end to a second bar which is itself pivotally mounted on the base framework.

10. A bed particularly for controlled rhythmic tilting, said bed comprising a base framework, an articulated support shaft including an upper shaft member and a lower shaft member, means carried by said base framework supporting said lower shaft member for rotation about a fixed axis, said lower shaft member having at the upper end thereof an elongated transversely extending bar including remote ends, supports extending upwardly from said bar remote ends, said upper shaft member including a lower frame member extending between said supports, aligned pivot means carried by said bars and defining a pivot axis for said upper shaft member, cooperating adjustable tilting means carried by said bar and said lower frame member in vertically spaced relation to said pivot axis for fixedly adjusting the tilting of said upper shaft member relative to said lower shaft member, said upper shaft member including an upper shaft, a mattress support framework, means carried by said mattress support framework mounting said mattress support framework on said upper shaft for relative rotation, means interconnecting said mattress support framework and said base framework for preventing rotational movement of said mattress support framework while permitting tilting thereof relative to said base framework, and drive means connected to said support shaft for rotating said support shaft to effect rhythmic tilting of said mattress support framework.

11. A bed as claimed in claim 10 wherein said adjustable tilting means includes a support arm depending from said lower frame member, and a cooperating screw and nut extending between said bar and said support arm.

12. A bed as claimed in claim 11 in which the means interconnecting the mattress support framework and the base framework to prevent a horizontal rotational movement of the mattress support framework relative to the base framework comprises a first bar pivotally attached at one end to the mattress support framework and at the other end to a second bar which is itself pivotally mounted on the base framework.

13. A bed as claimed in claim 10 wherein said adjustable tilting means includes a support arm depending from said lower frame member, and a cooperating screw and nut extending between said bar and said support arm, said screw being rotatably journaled in said bar in an axially fixed position and said nut being pivotally mounted on said support arm.

* * * * *