Oct. 8, 1957 J. S. RUBIN 2,808,828

ROCKING BED

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Fig. 1

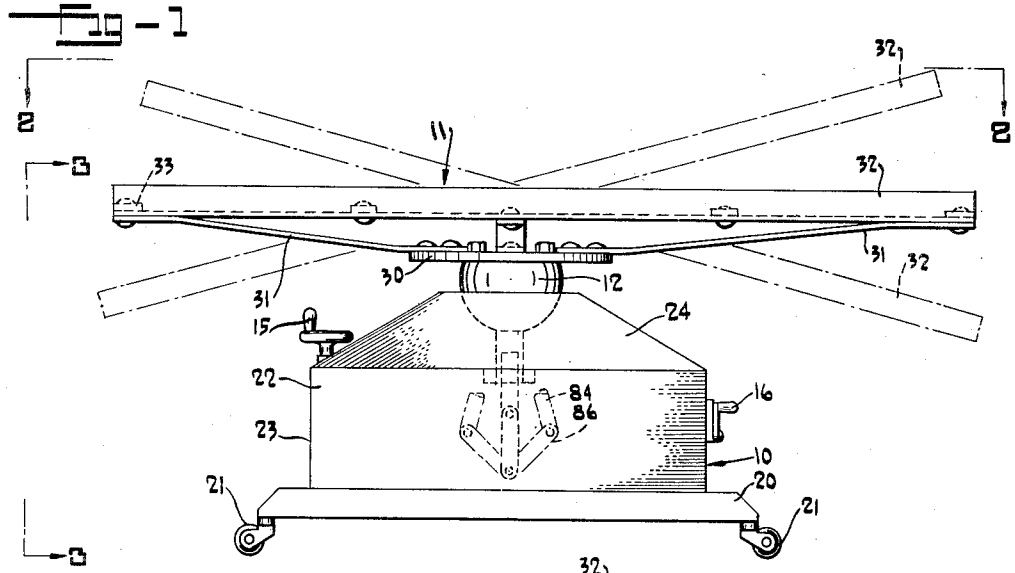


Fig. 2

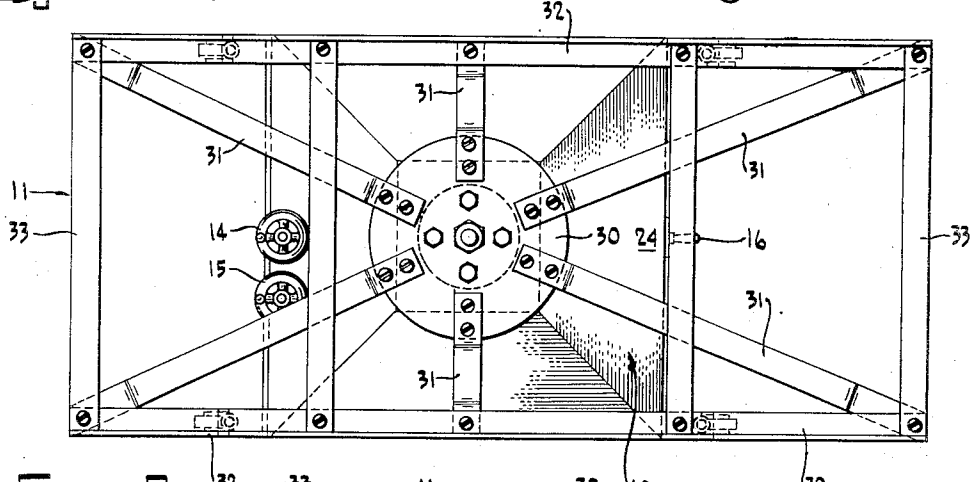
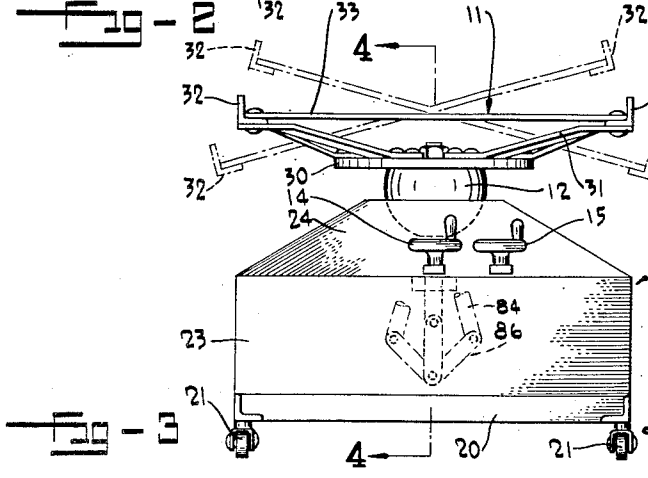


Fig. 3



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ROCKING BED

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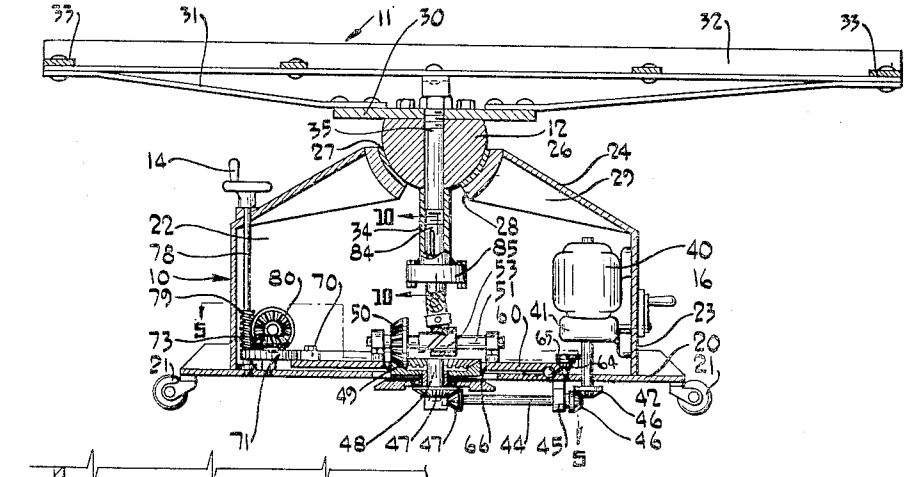
Fig - 4



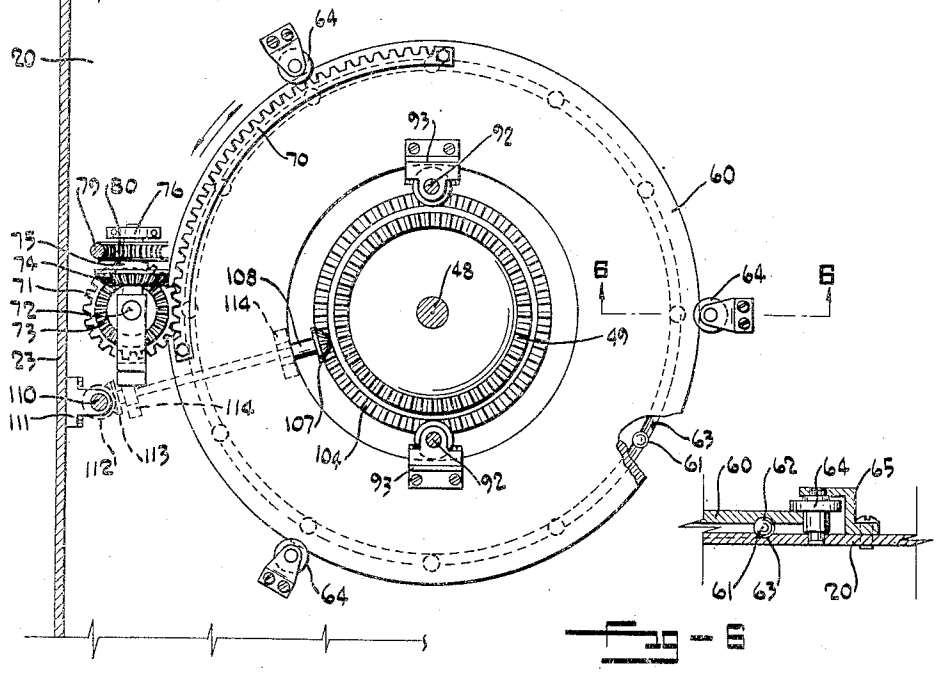


Fig - 6

Fig - 5

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ROCKING BED

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Fig. 7

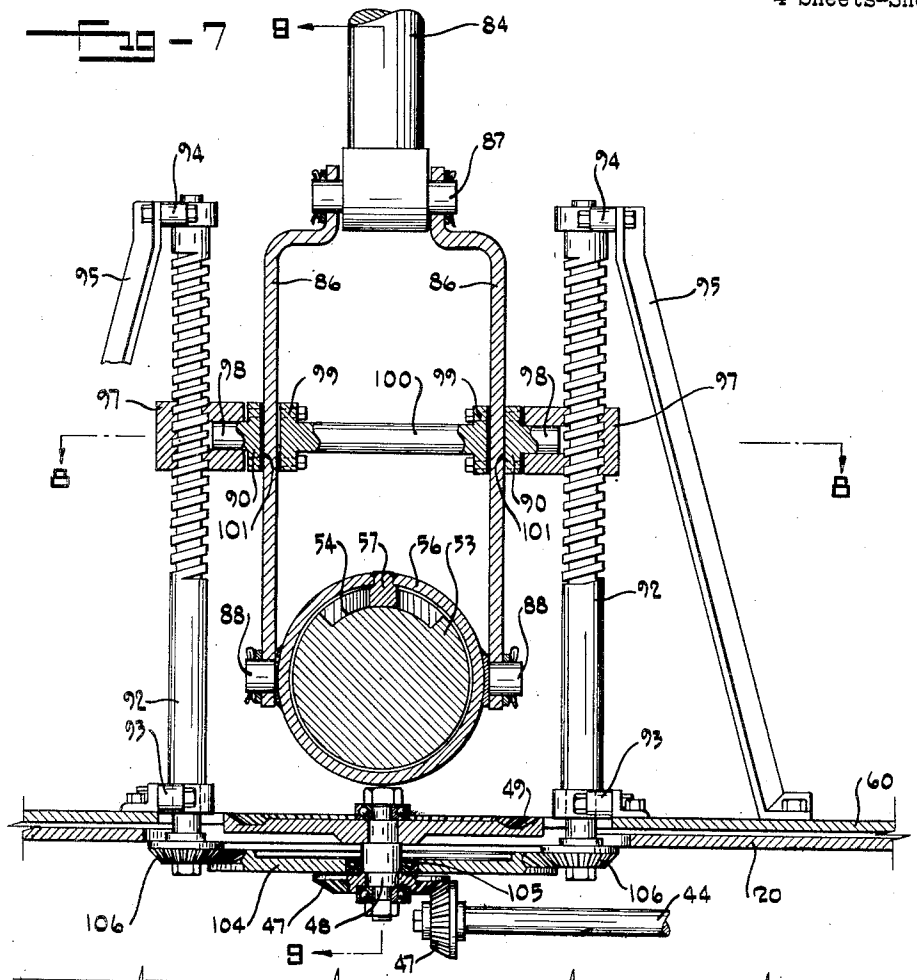

Fig. 8

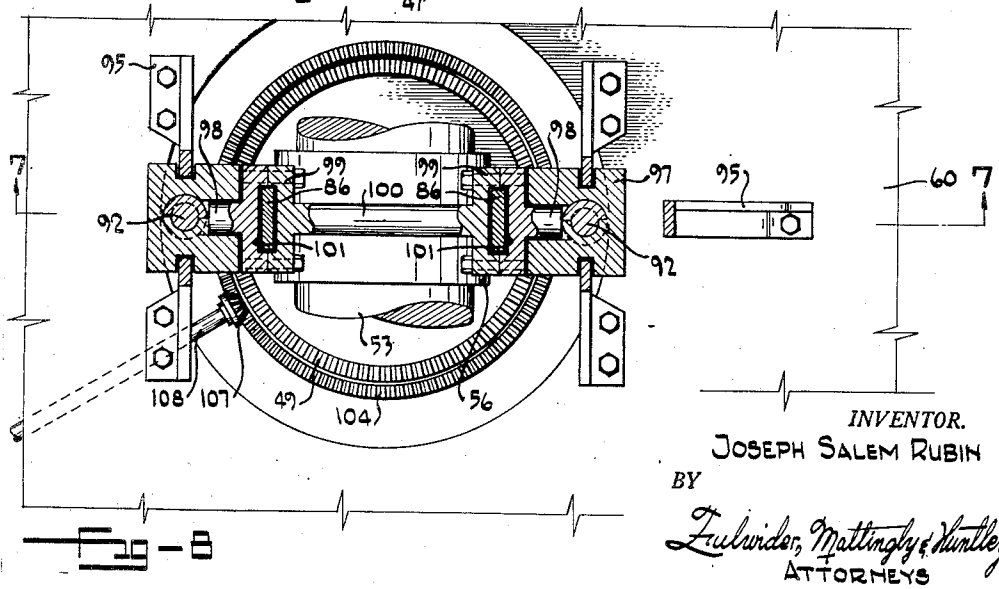

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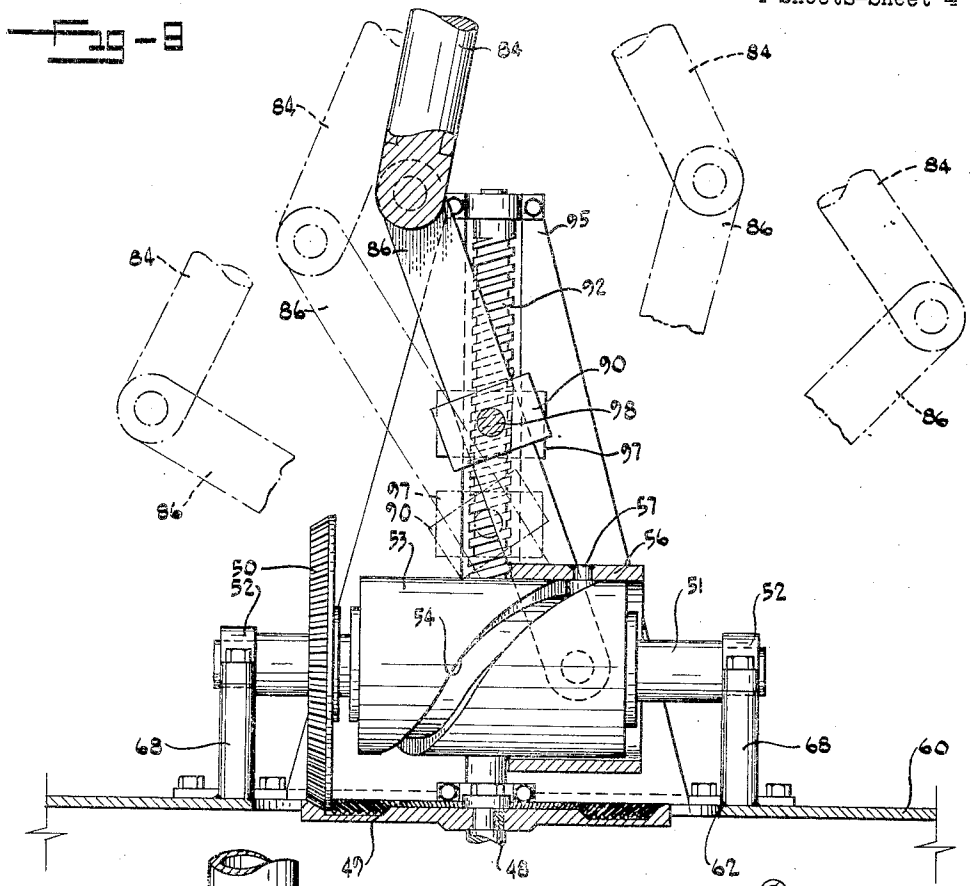
Fig-8



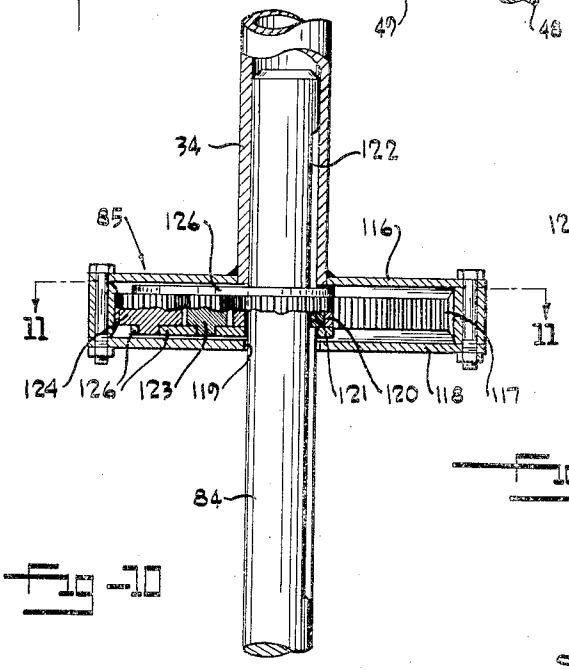


Fig-10

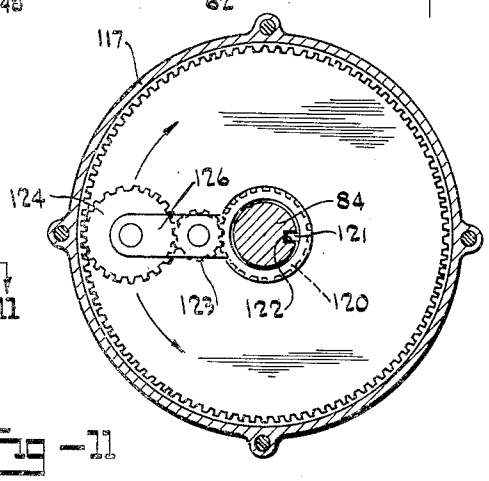


Fig-11

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United States Patent Office

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ROCKING BED

Joseph Salem Rubin, Los Angeles, Calif.

Application January 10, 1955, Serial No. 480,738

12 Claims. (Cl. 128—33)

My invention relates generally to hospital beds, and more particularly to a bed having an upper mattress supporting frame which is capable of universal tilting movement relative to a lower supporting base.

Such a bed is advantageous and desirable in the treatment and therapy given to many different types of patients. In some cases, it is desirable to tilt or rock the patient from head to foot by means of an oscillating motion which takes place around an axis extending transverse of the bed. In other cases, it will be desirable to rock or tilt the patient from side to side with an oscillating motion that takes place around an axis extending longitudinally of the bed. In some instances, it might also be desirable to move the patient with a motion that takes place on an axis extending oblique to either the longitudinal or transverse axes.

While the use of this general type of therapeutic treatment is of a relatively recent origin, it has already been found to be highly desirable in a number of different types of cases. For example, a patient suffering from paralysis of the muscles of respiration such as in poliomyelitis is aided considerably in breathing by a head to foot tilting motion. Such a motion is also desirable where there are injuries to the spinal cord at a high level, brain injuries or deficiencies in the circulation of the blood. In other cases, it has been found desirable to tilt the patient from side to side as for example to prevent sedimentation of body fluids, or to shift the point of weight bearing in bedridden patients. While the foregoing examples, are not intended to indicate any limitation upon the use of such a bed, they point out the desirability of a bed capable of tilting motion either from head to foot or side to side.

Heretofore, so-called respiratory beds, capable of head to foot tilting, have been provided. It is also known to provide beds which have a side to side tilting motion. However, neither of the foregoing types of beds have been capable of any adjustment of the axis upon which tilting takes place. That is, the structure of the bed permits either only tilting upon a fixed longitudinal axis or a fixed transverse axis. This occasions a duplication of equipment which is both expensive and space-consuming. Furthermore, in many instances it may be desirable to intermittently change the tilting motion given to the patient without removing him from the bed and this has not heretofore been possible.

With the foregoing in mind, it is a major object of my invention to provide a bed having an upper frame mounted for universal tilting motion and adjustably controlled for tilting movement upon either a horizontal longitudinal or horizontal transverse axis.

Another object of the invention is to provide a bed of the character described wherein both the stroke or amount of oscillating movement and the period or frequency thereof may be adjustably changed as desired.

It is also an object of the invention to provide a bed wherein the upper frame, although free for universal

tilting movement relative to its base, is held or locked against turning relative thereto.

Still another object of the invention is to provide a bed of the character described having adjustment controls which may be easily operated without necessity for interrupting the motion of the bed or disturbing the patient.

An additional object of the invention is to provide a bed designed to give safe and trouble free service.

These and other objects and advantages of the invention will become apparent from the following detailed description of a preferred form thereof, and from an inspection of the accompanying drawings in which:

Figure 1 is a side elevation of the complete bed;

Figure 2 is a plan view taken along the line **2—2** of Figure 1;

Figure 3 is an end elevation taken along the line **3—3** of Figure 1;

Figure 4 is a longitudinal medial section taken along the line **4—4** of Figure 3;

Figure 5 is a partial sectional view taken along the line **5—5** of Figure 4 with the central cam assembly removed;

Figure 6 is a sectional detail taken along the line **6—6** of Figure 5;

Figure 7 is an enlarged sectional view taken through the actuating mechanism;

Figure 8 is a cross section taken along the line **8—8** of Figure 7;

Figure 9 is a medial section taken along the line **9—9** of Figure 7;

Figure 10 is a sectional detail taken along the line **10—10** of Figure 4; and

Figure 11 is a cross section taken along the line **11—11** of Figure 10.

Referring now to the drawings and particularly to Figures 1 through 3 thereof, the general structure and function of the bed will be described before considering the details of a particular operating mechanism. The bed is provided with a lower base **10** and an upper mattress or spring-supporting frame **11**. Frame **11** is mounted to base **10** through a universal motion connection which includes an upper hemispherical ball **12** secured to the frame and in turn supported for free movement by base **10**. The center of ball **12** forms a point about which tilting or rocking motion of frame **11** occurs. As heretofore discussed, it may be desirable to have such tilting motion be about a horizontal transverse axis as indicated in Figure 1, or about a horizontal longitudinal axis as indicated in Figure 3, in accordance with the condition of the patient and the physician's judgement.

Also, it may be desirable to control and refine the tilting movement both as to angular amount or amplitude and the timing or period of the motion. The present embodiment of the bed, provides all of these controls, there being two control handles **14** and **15** at one end of base **10** and a third control handle **16** at the opposite end. Handle **14** controls the axis about which tilting motion takes place, handle **15** the amount or amplitude of the motion, and handle **16** the timing or period thereof as will hereinafter be explained. At the outset, it will thus be appreciated that I have provided a bed having movement which is almost universally adjustable as desired. In considering the detailed construction of the bed it is to be understood that the broader concepts of the invention are not limited by the particular structure to be described.

Base **10** is formed with a lower platform **20** which is of generally rectangular shape and may be supported by a plurality of casters **21** at the corners thereof. Extending upwardly from platform **20** is an outer box-like housing formed with side walls **22**, end walls **23** and in-

wardly angled top panels 24. Mounted in the center of top panels 24 is an upwardly facing socket 26 which is adapted to receive the previously mentioned ball 12 therein as is best seen in Figure 4. Socket 26 may have an inner antifriction lining 27 therein, and is provided with an enlarged bottom opening 28. Braces 29 extend outwardly from socket 26 beneath top panels 24 to form a heavy and rigid structure for supporting the weight of the upper frame 11 and the patient thereon. As can be appreciated, the socket 26 and ball 12 form a universal motion connection allowing the frame 11 to tilt or rock relative to base 10 in any direction.

Frame 11 includes a circular support plate 30 which is secured to the top of ball 12 and forms a hub for a plurality of radially directed struts 31 which extend outwardly and slightly upwardly. A rectangular open framework formed by side channels 32 and cross braces 33 is secured to the top ends of struts 31 to provide the platform for holding the remainder of the bed equipment such as a mattress or springs. It is to be understood, that if desired, the bed may have additional features, including elevating head and foot sections, commonly found in hospital beds.

Frame 11 is centered upon ball 12 and is caused to be tilted relative to base 10 by an actuating post 34 which projects downwardly from the ball and is rigidly secured thereon as by welding. Post 34 is of hollow tubular form, and its connection to ball 12 may be strengthened by a reenforcing pin 35 which passes downwardly through the vertical axis of the ball and into the post 34 a short distance. However, it is to be noted that the bottom portion of actuating post 34 is open for reasons as will hereinafter be explained. The bottom opening 28 of socket 26 surrounds post 34, and the edges of the opening limit the tilting movement of post 34 from the vertical, and thus the tilting movement of frame 11. For normal conditions, an angular motion of frame 11 of approximately 15° on either side of the horizontal is the maximum amplitude of movement which will be desired, and the opening 28 is proportionately sized to the actuating post 34.

The bed as thus far described is constructed for free tilting of frame 11 relative to base 10. In order to impart to frame 11 a regular and periodic motion it is necessary to provide actuating means capable of producing a reciprocating or oscillating motion which can be applied to the lower end of actuating post 34. Swinging the end of post 34 back and forth will cause tilting movement of frame 11 and the direction of the oscillating motion will determine the direction of the axis about which the tilting motion of frame 11 occurs. In other words, if the bottom of post 34 is moved transversely of base 10, frame 11 will tilt from side to side about a longitudinal axis, and if the motion of post 34 is longitudinal of the base the frame will tilt from head to foot about a transverse axis. The effective amplitude of this motion as applied to the actuating post 34 and the period or frequency thereof will, of course, control the amplitude and period of the motion of frame 11.

In order to operate the actuating means it is necessary to provide some form of force-applying means, and in this instance a variable speed electric motor 40 is utilized. Motor 40 is of conventional design and together with a suitable speed reduction unit 41 is mounted vertically upon one end wall 23 of base 10. An output shaft 42 from reduction unit 41 projects downwardly and passes rotatably through platform 20. Previously mentioned control handle 16 extends through wall 23 and is used to control the speed of motor 40. The details of the speed control mechanism in and of themselves form no part of this invention and are accordingly not included herein.

Mounted at right angles to output shaft 42 is a cross shaft 44 which is rotatably supported from the bottom of platform 20 by a bearing bracket 45. Bevel gears 46 transmit the motion from shaft 42 to cross shaft 44, and the latter extends inwardly to the center of platform 20 in a position approximately below post 34 where it transmits the motion through bevel gears 47 to a short vertical stub shaft 48 which may be considered as the main drive shaft. It will thus be seen that a source of variable speed rotating motion is provided at the center of base 10 where it may be applied to actuating post 34.

However, the rotational movement of drive shaft 48 must be converted to an oscillating or reciprocating motion to be properly applied to the actuating post 34. Moreover, the direction of the reciprocating motion must extend longitudinally of platform 20 if frame 11 is to tilt from head to foot, and transversely of platform 20 if the frame is to tilt from side to side. Also, it is desirable to be able to adjust the amplitude or stroke of the applied motion as was previously discussed. To this end, I provide a variable stroke and variable direction oscillating motion mechanism which may best be understood by referring first to Figures 7 through 9.

Fixed for rotation on the upper end of drive shaft 48 is an internal bevel gear 49 which meshes with an offset bevel gear 50 as is best seen in Figure 9. Gear 50 is fixedly mounted on a horizontally extending cam shaft 51 which is supported above platform 20 by end bearings 52. Shaft 51 is formed with a centrally enlarged cylindrical cam portion 53 having a spirally cut endless groove 54 therein. A short sleeve or carriage 56 is slidably mounted upon cam portion 53 and is held against rotation in a manner as will later be described. Sleeve 56 has a pin or cam follower 57 depending therein which is adapted to ride within groove 54, and upon rotation of shaft 51 is caused to travel back and forth along the length of cam 53 with a fixed stroke. The period or frequency of the stroke will, of course, depend upon the speed of rotation of shaft 51 which is variable as previously described.

It will be remembered, that the direction of the oscillating motion applied to the bottom of actuating post 34 must be variable from a longitudinal to a transverse direction in order to accomplish a major object of the invention. To this end, the entire cam mechanism just described is mounted upon a rotatable turntable 60 as may best be seen from an inspection of Figures 4 and 5. Table 60 is of flat circular shape and is rotatably supported on the top of platform 20 by a set of peripherally spaced balls 61 which are partially engaged in detents 62 formed in the bottom of the table and also in an annular groove 63 formed in platform 20. Spaced around the edge of table 60 are a plurality of flanged hold down rollers 64 which rotatably override the edge of the table and are supported by brackets 65 secured to platform 20. The details of the hold down rollers 64 are best seen in Figure 6.

Table 60 has an enlarged central opening 66 therethrough which is spaced around the drive bevel gear 49. Diametrically positioned across the edges of openings 66 are upstanding brackets 68 which support the previously mentioned cam shaft bearings 52 so that the entire cam mechanism is mounted for rotation with table 60. Movement of table 60 is controlled through a sector gear 70 mounted near the periphery thereof and extending around an arc of slightly more than 90° as is best seen in Figure 5. Sector gear 70 is engaged with a pinion gear 71 which is carried by a short vertical shaft 72 rotatably supported on platform 20 near the edge of table 60 and adjacent to the control handle 14. In addition to pinion 71, shaft 72 carries a bevel gear 73 which is engaged with a bevel gear 74 mounted at right angles thereto and carried on a short horizontal shaft 75 supported above platform 20 by a bearing bracket 76.

The control handle 14 is mounted upon a vertical shaft 78 rotatably supported by wall 24 and platform 20 and has affixed near its lower end a worm screw 79 which

meshes with a worm wheel 80 carried on shaft 75. As can thus be seen, rotation of control handle 14 drives through the gear chain just described to rotate pinion 71 and sector gear 70. Table 60 may thus be turned through an angle of 90° causing a shift of cam shaft 51 from a position extending longitudinally of base 10 to a position extending transversely thereof. The oscillating motion of cam follower 57 which is to be applied to actuating post 34 is thus changed from the longitudinal to the transverse direction with a corresponding change in the axis about which the tilting of upper frame 11 occurs. Attention is also directed to the fact that with the mechanism just described, the tilting axis may lie in some intermediate direction oblique to both the longitudinal and transverse axes of the bed by proper adjustment of table 60.

The motion of cam follower 57 is applied to actuating post 34 through a linkage mechanism which is adjustable to control the amplitude or stroke of the motion as will now be described. Considering first the construction of the lower end of post 34, it will be seen to make slidable engagement with the upper end of a connecting rod 84 which is fitted therein. Connecting rod 84 is also freely rotatable within post 34 and passes through an enlarged flange-like housing 85 which is secured to the lower end of the post to form a locking means as will hereinafter be described. The nature of the connection between post 34 and connecting rod 84 is such as to allow the post 34 to swing in an arc about the center of ball 12 without lifting rod 84 relative to platform 20.

Referring now to Figures 7 through 9, the lower end of connecting rod 84 is pivotally connected to a bifurcated lever or yoke comprising a pair of parallel lever arms 86 secured to rod 84 by a pivot pin 87. The lower ends of arms 86 spread outwardly so as to bracket cam follower sleeve 56 and are pivotally connected thereto by short pivot ears 88. Intermediate their ends, lever arms 86 are slidably engaged with a pair of fulcrum blocks 90 which are positioned in a vertical plane at the center of cam 53, as is seen in Figure 9, and are vertically adjustable but held against longitudinal movement relative to the cam assembly. The blocks 90 are supported for rotation about a horizontal axis so as to pivotally support lever arms 86 as a first class lever means. By moving fulcrum blocks 90 up and down, the fulcrum axis is caused to be moved closer to one end or the other of the lever arms, so as to change the throw or stroke of the upper ends of the lever arm and hence the connecting rod 84. In other words, the movement of the lower ends of lever arms 86 has a fixed stroke as determined by the movement of cam follower 57, but the movement of the upper ends of the lever arms may be increased or diminished by adjustment of fulcrum blocks 90. When the fulcrum blocks 90 are moved upwardly very close to the upper end of lever arms 86 the connecting rod 84 will have a very short stroke, and when the blocks 90 are moved very close to the lower end of arms 86 the connecting rod will have a very long stroke. The phantom positions of lever arms 86 and connecting rod 84 shown in Figure 9 indicate variations in the stroke which may be achieved.

In order to adjust the position of fulcrum blocks 90, a pair of vertically extending support screws 92 are positioned on either side of cam 53 and rotatably mounted on table 60 by lower support bearings 93. Upper bearings 94 may also be engaged with screws 92 and held rigidly in position by heavy angular braces 95. While each of screws 92 is mounted for rotation about its own axis, it should be noted that the screws always maintain the same position with respect to the cam assembly upon turning of table 60, since they are commonly mounted thereon.

Threadedly engaged on support screws 92 are a pair of adjustment nuts 97 which are in turn connected to fulcrum blocks 90. By reason of the engagement between fulcrum blocks 90 and adjustment nuts 97 the latter are held against rotation, and upon rotation of screws 92 the adjustment nuts thus threadedly advance up or down thereon. In the construction as shown, each of fulcrum blocks 90 has a short pivot ear 98 projecting outwardly and rotatably engaged in the corresponding nut 97. In assembly, the nuts 97 are aligned in corresponding positions on screws 92 before connection to blocks 90 so that pivot ears 98 lie on a common horizontal axis, which, of course, form the adjustable fulcrum axis of the linkage. Inwardly of lever arms 86 a pair of outwardly facing cap members 99 are joined together by a short bar 100. The cap members 99 are bolted to fulcrum blocks 90 in encircling relationship to lever arms 86 so as to form a very sturdy construction. As is best seen in Figure 8, the adjacent faces of blocks 90 and cap members 99 are recessed slightly to define slots 111 which slidably receive arms 86.

Rotation of screws 92 is effected by means of a large bevel gear 104 which is supported on drive shaft 48 but is freely rotatable thereon by means of a central bearing 105. Each of screws 92 carries a bevel pinion 106 on the lower end thereof which is meshed with gear 104 so that rotation of the latter causes simultaneous and equal rotation of the screws. Bevel gear 104 is in turn driven by a bevel pinion 107 which is mounted at right angles thereto on the end of a horizontal shaft 108 as is best seen in Figure 5.

As will be remembered, the control handle 15 is provided to operate the stroke adjustment mechanism. This handle 15 is mounted upon a vertical rod 110 that is rotatably journaled on platform 20 by a bearing 111. On the end of rod 110 is a bevel pinion 112 which meshes with a pinion 113 carried on the outer end of shaft 108, the latter being rotatably mounted to platform 20 by bearings 114. As can thus be seen, rotation of control handle 15 through the gear chain just described rotates support screws 92 to vertically adjust the fulcrum blocks 90.

While the bed thus far described is capable of all of the desired movement, it is also capable of a relative turning movement which is undesirable. That is, because of the universal movement connection between ball 12 and socket 26, upper frame 11 can swing horizontally around base 10 and such a motion combined with the tilting motion might upset or dislodge the patient. It will also be seen upon reflection that this problem can not be overcome by a simple connection between actuating post 34 and connecting rod 84 since the latter must be free to turn with the table 60 and lever arms 86.

I therefore provide a mechanism for locking upper frame 11 against horizontal turning which allows rotation of connecting rod 84 relative to actuating post 34 but not the reverse. This mechanism is best seen in Figures 10 and 11 and comprises an epicyclic train of gears arranged for unidirectional driving. Post 34 carries on the lower end thereof, a housing 85 which comprises an upper circular plate 116 rigidly to the post, and bolted to an annular internal ring gear 117 and a lower circular base plate 118. Connecting rod 84 extends through housing 85 and upwardly into post 34, passing freely through an opening 119 formed in plate 118. Mounted within housing 85 is a central gear 120 which is concentric with rod 84. Gear 120 is provided with an internal key 121 which engages within an elongated groove 122 formed in rod 84. Gear 120 is thus keyed for rotation with rod 84 but permits relative sliding movement therebetween.

Between central gear 120 and the outer ring gear 117 are two gears 123 and 124 which are meshed with each other and the gears 120 and 117, respectively. The inner gear 123 may be designated as the intermediate gear and the outer gear 124 as the locking gear. Both of gears 123 and 124 are mounted for rotation about their individual axes on a pair of links or arms 126 which

extend radially outwardly from rod 84 and pass above and below the gears. Arms 126 are in turn journaled for free rotation about rod 84 so that gears 123 and 124 become planet gears of the epicyclic gear train. Attention is directed to the fact that the locking gear 124 is made the same diameter and with an equal number of teeth as the central gear 120. The exact size of intermediate gear 123 is not, however, critical.

With the epicyclic gear train as described, center gear 120 and locking gear 124 are locked together for equal and simultaneous rotation. Rotation of arms 126 about rod 84 has no effect upon the relative position of either gear 120 or gear 124 with respect to its own rotational axis. It should also be noted that ring gear 117 can not rotate without causing rotation of locking gear 124 with which it is meshed. Thus, the center gear 120 which is normally held against rotation by rod 84 holds locking gear 120 against rotation through intermediate gear 123, and the locking gear 120 holds ring gear 117 against rotation.

The first condition of the mechanism is therefore satisfied, since ring gear 117 can not rotate, actuating post 34 can not rotate, and the upper frame 11 is held against rotation or turning relative to base 10. When it is desired to shift the tilting axis as has been previously described, the turning or rotation of table 60 causes the entire actuating mechanism to turn, and in the limiting position, connected rod 84 is turned or rotated through an angle of 90°. Center gear 120 is therefore rotated through an angle of 90° or a quarter of a turn, and in accordance with the principle of the gear train locking gear 124 must also rotate an equal amount, or a quarter of a turn.

At this point it should be remembered that when the actuating mechanism is shifted, it is not desirable to turn or rotate frame 11 relative to base 10 but to hold it in the same relative position. It can also be appreciated that if the rotation of locking gear 124 is applied to ring gear 117, the latter, because of its larger size will be caused to turn through a small angle and will turn frame 11 relative to base 10. However, this last motion need not take place because the rotation of gear 124 may be taken up either by turning gear 117, or by itself revolving internally of gear 117 through movement of the free turning arms 126. Thus by holding frame 11 with a slight hand pressure when the tilting axis is shifted, the frame does not turn relative to base 10. In other words, the rotation of gear 124 is indeterminate and may either drive gear 117, or arms 126 about connecting rod 84. Any resistance to turning of gear 117 causes the choice to be made in favor of turning arms 126. When the rod 84 has reached its new position, it is held against further movement, and frame 11 is positively locked as has been described.

While I have thus shown and described an embodiment of the invention which is fully capable of carrying out the objects thereof, it is to be understood that considerable modification may be made without departing from the principles of the invention. Therefore, I do not wish to be restricted to the foregoing details, except as defined in the appended claims.

I claim:

1. A bed comprising: a base; an upper frame mounted on said base for universal tilting movement about a central point; actuating means mounted on said base and having drive means and connected to said frame for tilting said frame with an oscillating motion about a given horizontal tilt axis; and means associated with said actuating means for rotating said drive means about a substantially vertical axis to change the orientation of said tilt axis in the horizontal, said drive means being operable independently of said last mentioned means.

2. A bed comprising: a base; an upper frame mounted on said base for universal tilting movement about a central point; actuating means mounted on said base and having drive means connected to said frame for tilting said frame with an oscillating motion about a given horizontal tilt axis; means associated with said actuating means for rotating said drive means about a substantially vertical axis to change the orientation of said tilt axis in the horizontal, said drive means being operable independently of said last mentioned means; varying the angular amount of said oscillating motion.

3. A bed comprising: a base; an upper frame mounted on said base for universal tilting movement about a central point; actuating means mounted on said base and having drive means connected to said frame for tilting said frame with an oscillating motion about a given horizontal tilt axis; means associated with said actuating means for rotating said drive means about a substantially vertical axis to change the orientation of said tilt axis in the horizontal, said drive means being operable independently of said last mentioned means; and means connected with said actuating means for varying the period of said oscillating motion.

4. A bed comprising: a base; an upper frame mounted on said base for universal tilting movement about a central point; actuating means mounted on said base and having drive means connected to said frame for tilting said frame with an oscillating motion about a given horizontal tilt axis; means associated with said actuating means for rotating said drive means about a substantially vertical axis to change the orientation of said tilt axis in the horizontal, said drive means being operable independently of said last mentioned means; and means connected between said frame and said base for holding said frame from turning relative to said base about a vertical axis passed through said central point.

5. A bed comprising: a base; an upper frame mounted on said base for universal tilting movement about a central point; actuating means mounted on said base and having drive means connected to said frame for tilting said frame with an oscillating motion about a given horizontal tilt axis; means associated with said actuating means for rotating said drive means about a substantially vertical axis to change the orientation of said tilt axis in the horizontal, said drive means being operable independently of said last mentioned means; means connected with said actuating means for varying the annular amount of said oscillating motion; means connected with said actuating means for varying the period of said oscillating motion; and means connected between said frame and said base for holding said frame from turning relative to said base about a vertical axis passed through said central point.

6. A bed comprising: a base; an upper frame; a universal movement connection between the center of said frame and said base supporting said frame for universal tilting movement about said connection; an operating post extending downwardly from said frame and connected rigidly thereon; actuating means mounted on said base and having drive means connected to said post for moving said post with an oscillating motion to tilt said frame about a given horizontal tilt axis passing through said connection; means connected with said actuating means for rotating said drive means about a substantially vertical axis to change the orientation of said tilt axis in the horizontal, said drive means being operable independently of said last mentioned means; and means connected between said frame and said base for holding said frame from turning relative to said base about a vertical axis passed through said connection.

7. A bed comprising: a base; an upper frame; a universal movement connection between the center of said frame and said base supporting said frame for universal tilting movement about said connection; an operating post extending downwardly from said frame and connected rigidly thereon; actuating means mounted on said base and connected to said post for moving said post with an oscillating motion to tilt said frame about a given horizontally extending tilt axis passing through said con-

nection; means connected with said actuating means for varying the angular amount of said oscillating motion; means connected with said actuating means for varying the period of said oscillating motion; means connected with said actuating means for shifting said actuating means from a direction extending lengthwise of said frame to a direction extending transverse thereof; and means connected between said frame and said base for holding said frame from turning relative to said base about a vertical axis passed through said central point.

8. A bed comprising: a base; an upper frame; a ball and socket connection between the center of said frame and said base supporting said frame for universal tilting movement about said connection; an operating port rigidly attached to said frame and extending downwardly through said connection; actuating means mounted on said base and connected to said post for moving said post with an oscillating motion to tilt said frame about a horizontal axis passing through said connection; a drive motor connected with said actuating means for operating said actuating means; means connected with said actuating means for shifting said actuating means from a direction extending lengthwise of said frame to a direction extending transverse thereof; and locking means connected between said port and said actuating means for locking said post against rotation about its own longitudinal axis to hold said frame from turning relative to said base.

9. A bed comprising: a base; an upper frame; a ball and socket connection between the center of said frame and said base supporting said frame for universal tilting movement about said connection; actuating means mounted on said base and connected to said post for moving said post with an oscillating motion to tilt said frame about a horizontal axis passing through said connection; means connected with said actuating means for varying the angular amount of said oscillating motion; a variable speed drive motor connected with said actuating means for operating said actuating means and varying the period of said oscillating motion; and means connected with said actuating means for shifting said actuating means from a direction extending lengthwise of said frame to a direction extending transverse thereof.

10. A bed comprising: a base; an upper frame; a ball and socket connection between the center of said frame and said base supporting said frame for universal tilting movement about said connection; an operating post rigidly attached to said frame and extending downwardly through said connection; actuating means mounted on said base and connected to said post for moving said post with an oscillating motion to tilt said frame about a horizontal axis passing through said connection; means connected with said actuating means for turning said actuating means relative to said post from a direction extending

lengthwise of said frame to a direction extending transverse thereof; adjustable linkage means connected with said actuating means for varying the stroke of said oscillating motion; a variable speed drive motor connected with said actuating means for operating said actuating means and varying the period of said oscillating motion; and locking means connected between said post and said actuating means for locking said post against rotation about its own longitudinal axis to hold said frame from turning relative to said base.

11. A bed comprising: a base; an upper frame; a ball and socket connection between the center of said frame and said base supporting said frame for universal tilting movement about said connection; an operating post rigidly attached to said frame and extending downwardly through said connection; a reciprocating cam mechanism mounted on said base and connected to said post for moving said post with an oscillating motion to tilt said frame about a horizontal axis passing through said connection; means connected with said cam mechanism for turning said mechanism relative to said post from a direction extending lengthwise of said bed to a direction extending transverse thereof; and adjustable linkage means connected with said cam mechanism and said post for varying the amount of movement of said post for a given stroke of said cam mechanism.

12. A bed comprising: a base; an upper frame; a ball and socket connection between the center of said frame and said base supporting said frame for universal tilting movement about said connection; an operating post rigidly attached to said frame and extending downwardly through said connection; a reciprocating cam mechanism mounted on said base and connected to said post for moving said post with an oscillating motion to tilt said frame about a horizontal axis passing through said connection; a variable speed drive motor connected with said cam mechanism for operating said mechanism and varying the time of reciprocation thereof; means connected with said cam mechanism for turning said mechanism relative to said post; adjustable linkage means connected with said cam mechanism and said post for varying the amount of movement of said post for a given stroke of said cam mechanism; and locking means connected between said post and said cam mechanism for locking said post against rotation about its own longitudinal axis to hold said frame from turning relative to said base.

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