

- [54] **BEDS**
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- [22] **Filed:** Aug. 5, 1971
- [21] **Appl. No.:** 169,184
- [30] **Foreign Application Priority Data**
Aug. 6, 1970 Great Britain38,018/70
- [52] **U.S. Cl.**..... 5/61, 5/109
- [51] **Int. Cl.**..... A61g 7/10
- [58] **Field of Search** 5/60-64,
5/66, 68, 109

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[57] **ABSTRACT**
A bed for patients who are unable to move about in bed to prevent sores comprises an elongate carrier structure having a web of flexible sheet material hung across it and power-drivable means for turning the carrier structure to and fro so as to cause different parts of the patient's anatomy to support his weight.

10 Claims, 6 Drawing Figures

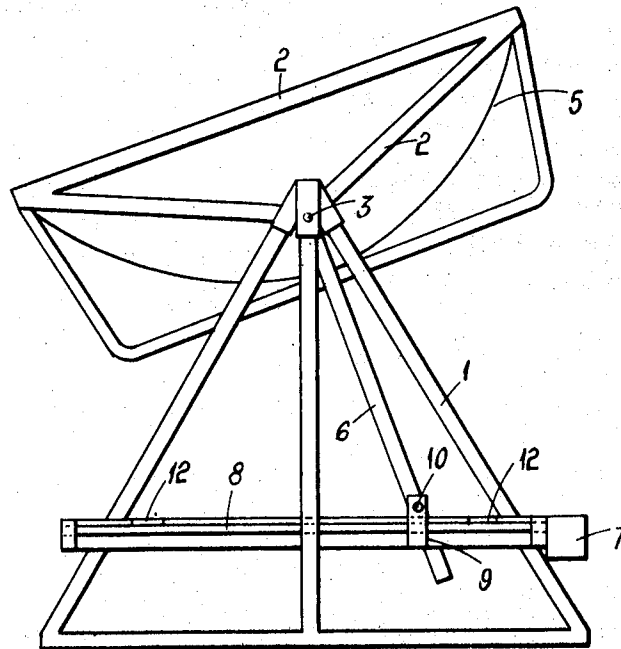


Fig. 1

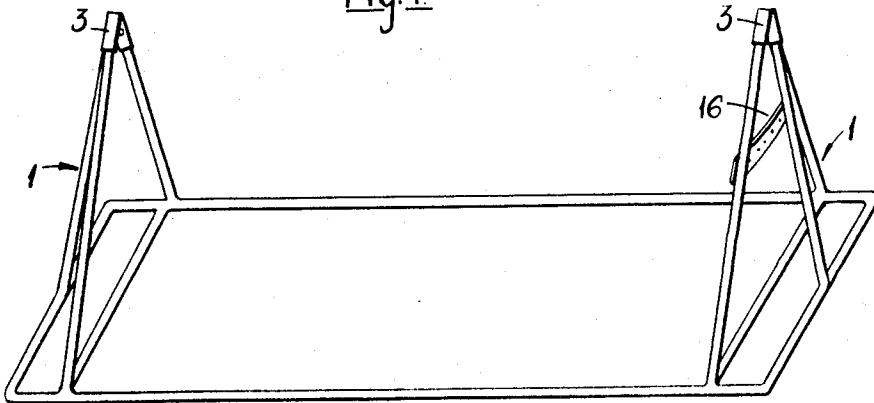


Fig. 2

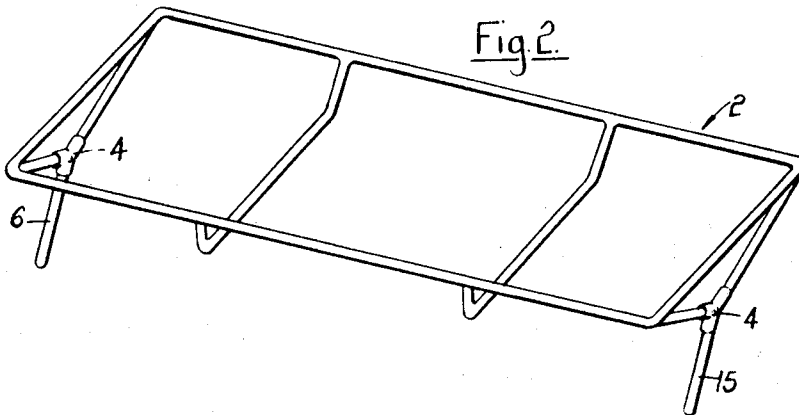


Fig. 5

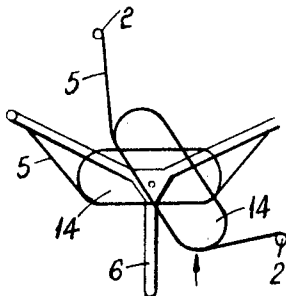
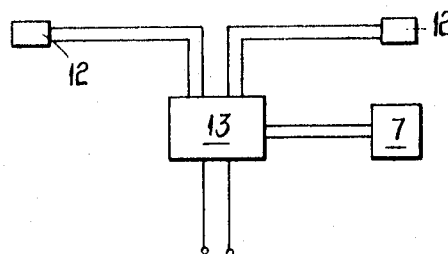
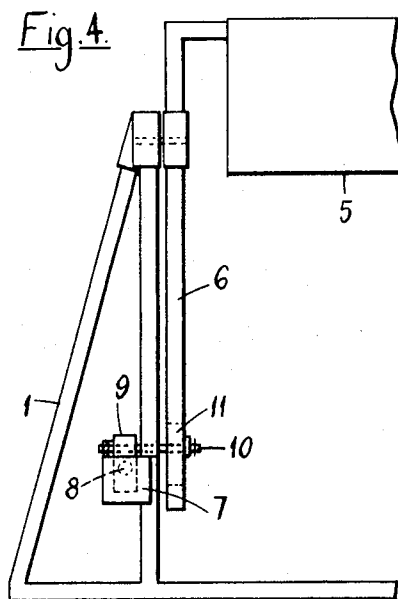
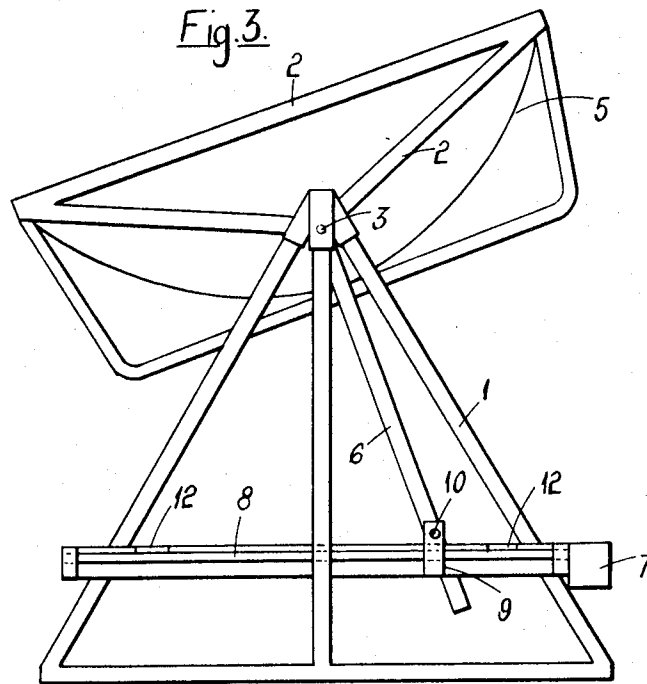


Fig. 6



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BEDS

This invention relates to beds, particularly but not exclusively for use by patients who are paralysed or otherwise unable to move about in bed.

As is well known, lying in bed in one position for prolonged periods gives rise to bed sores. Thus patients who cannot move about and change their lying position in bed are particularly prone to these sores and therefore have to be bodily moved at frequent intervals, giving rise to arduous work for nursing staff.

It is an object of this invention to eliminate or at least substantially to reduce these problems by providing a bed having means for automatically varying the parts of a patient's anatomy which bear the pressure of the patient's body weight.

According to the invention there is provided a bed comprising a base structure, an elongate carrier structure arranged to be supported by said base structure for pivotal movement relative thereto about an axis substantially parallel to the length of the carrier structure, and power-drivable means for turning the carrier structure about said axis either continuously or intermittently between limits, the carrier structure having one or more webs of flexible sheet material hung across it to provide a slack support for the body of a patient lying lengthways of the carrier structure, so that in use the said web or webs will support a patient's weight via successively different parts of his anatomy as the carrier structure is turned.

It will be appreciated that the said web or webs must be hung with sufficient slack to retain the patient's body thereon at the limits of pivotal movement of the carrier structure; on the other hand the web or webs must not be so slack that there is an insufficient range of variation of the parts of the patient's anatomy via which his weight is supported between such limits.

The said power-drivable means may be such as automatically to turn the carrier structure from one limit to the other of its pivotal movement and then to require a manual operation to reverse such movement; preferably, however, the power-drivable means incorporates means, e.g. in the form of automatic limit switches, for automatically reversing the direction of movement of the carrier structure each time that it reaches a limit of its pivotal movement.

A suitable material for the web(s) would be a medium duty canvas, such as is used for hammocks, and in a preferred arrangement this is hung between the two long sides of a substantially rectangular frame constituting the said carrier structure. Although the web(s) may be attached to the carrier structure by means of tension members, e.g. ropes, springs or elastic, it is preferred to secure the web(s) directly to the carrier structure; thus the edges of the web(s) may be wound around an appropriate frame member of such structure and secured thereto by fastening means, or indeed the free edges after being wound round the respective frame member once may be stitched to the length extending across the frame. If desired, the web(s) might be provided with peripheral hooks, enabling ready attachment and detachment of the web(s) to and from the carrier frame.

The power-drivable means for turning the carrier structure will preferably be such as to be drivable by means of an electric motor or motors, since such motors may be easily powered in a hospital ward and can be quite quiet-running. Other forms of power actua-

tion, such as hydraulic or pneumatic actuation are possible, but would require special adaptation of a ward.

A convenient and preferred way of effecting the drive to the carrier structure is by means of a lever arm rigidly connected to or integral with the said structure, the arm being in driving connection with the electric motor or other prime mover. Such a driving connection may conveniently comprise a nut pivotally and slidably associated with the arm and carried on a screw driven by an electric motor, such screw extending transversely of the axis of pivotal movement of the carrier structure. Limit switches may be provided adjacent the screw for engagement by the nut when it reaches the respective ends of its travel, corresponding to the maximum angular displacement of the carrier structure, such switches being coupled to the electric motor for reversing its direction of rotation on actuation of the switches. With such an arrangement, once drivingly connected to the prime mover, the carrier structure will turn to and fro indefinitely. Clearly, the position of the limit switches may be made adjustable so as to enable different amplitudes of displacement to be selected.

Alternative drive means are possible within the scope of this invention, for example a lever arm as mentioned above may be mechanically connected to a crank mounted on a wheel arranged to be continuously driven in one sense by an electric motor, to turn the carrier structure continuously to and fro.

It should be understood that the turning movement of the carrier structure in use need not be continuous. Thus arrangements may be provided in accordance with the invention in which the carrier structure is automatically moved stepwise through a succession of positions between its limit positions; power-drivable means for accomplishing this effect could for example comprise a screw as above described which is intermittently rotatable, through a sprocket fixed to the screw, by means of a wheel having teeth extending around only a part of its circumference and thus intermittently engageable with the sprocket.

It has been found that optimum rates of movement of the carrier structure are between one-third and five complete cycles (i.e. to and fro movements) per hour. The bed may also be arranged so that the carrier structure can be turned manually when desired, and be locked in any position. A convenient means for locking the carrier structure comprises an arcuate metal plate rigidly fixed to the base structure and a further lever arm connected to or integral with the carrier structure and registering with said plate, fastening means being provided for securing said further arm to said plate in any of a number of different positions of said carrier structure.

In order that the invention may be readily understood, an embodiment thereof will now be described by way of example with reference to the accompanying drawings in which:

FIG. 1 is a perspective view of a base structure of a bed according to the invention,

FIG. 2 is a perspective view of a carrier structure for pivotal mounting on the base structure of FIG. 1,

FIG. 3 is an end view of the structures of FIGS. 1 and 2 operatively combined, showing a drive mechanism for turning the carrier structure,

FIG. 4 is a side view of one end of the bed shown in FIG. 3,

FIG. 5 is a diagrammatic end view of the carrier structure in two positions, and

FIG. 6 shows an electrical circuit which may be employed for controlling the turning movement of the carrier structure.

Referring to the drawings, there is shown a bed comprising a floor standing base structure in the form of a frame 1 which is adapted to support a carrier structure in the form of a frame 2 for pivotal movement relative thereto by means of a pivot bolt (not shown) passing through the joints 3,4 of the structural members of the base frame 1 and carrier frame 2 respectively. The structural members of both frames comprise 2 inch diameter aluminium tubing.

As seen in FIG. 2 the carrier frame 2 is substantially rectangular and is elongate so as to accommodate the body of a lying patient. It will thus be seen that the frame 2 is mountable on the base frame 1 for pivotal movement about an axis extending parallel to the length of the carrier frame and generally axially of the body of a patient in use. It should however be understood that the pivotal axis of the carrier frame could in other embodiments of the invention be positioned substantially above or below its position here shown, relative to the carrier frame; furthermore such axis need not necessarily lie in the longitudinal plane of symmetry of the carrier frame but could be substantially to one side or the other of such plane, e.g. coincident with one of the side members of the frame if desired.

Hung across the carrier frame 2, and fixed thereto along both its long edges by stitching, is a substantially rectangular web 5 of medium duty canvas, a flexible sheet material, which is adapted in use to support the body of the lying patient.

Referring now to FIGS. 3 and 4, power-driven means are provided for automatically turning the carrier frame 2 to and fro about said axis of rotation. A lever arm 6 is rigidly connected to the carrier frame 2, which arm extends generally downwardly and is in driving connection with a prime mover in the form of an electric motor 7 mounted on the base frame 1 although not shown in FIG. 1. Motor 7 is coupled to a screw 8 extending transversely of the axis of rotation of frame 2, and mounting a nut 9. A pivot pin 10 sliding in a longitudinal slot 11 in the lever arm 6 pivotally and slidably connects the lever arm 6 to the nut 9. It will thus be understood that actuation of the motor 7 causes the nut 9 to travel along screw 8 and thus to turn the carrier frame 2 about its pivotal axis.

Limit switches 12 are provided on the mounting means for the screw 8, for engagement by the nut 9 when it reaches the desired limits of its travel. Actuation of a limit switch 12 causes, by means of control box 13 (FIG. 6), the polarity and hence driving direction of the motor 7 to be reversed. Thus once the mains M have been connected to the control box 13, the bed can be set to turn to and fro indefinitely. The position of the limit switches 12 is adjustable to vary the amplitude of swing, as is the speed of rotation of the screw 8 enabling the frequency of swing to be varied.

In an alternative arrangement, not shown in the drawings, two adjacent parallel screws 8 are arranged to rotate in opposite senses. The nut 9 is replaced by a block member incorporating two female threaded driving members in threaded engagement with respective screws 8, such driving members being rotatable relative to the block member but being alternately lockable

against rotation by locking means provided in or on the block member and arranged to transfer the locking action from one driving member to the other at the limits of stroke. Thus with both screws rotating continuously, the block member will cyclically traverse the screws under the action of alternate driving members. When one driving member is locked by said locking means against rotation, the other will rotate freely and therefore not impede translation of the block member.

In yet a further development, again not shown, a single screw 8 is provided at each end with a respective electric motor, which motors will be arranged to rotate the screw in respective opposite directions to drive a nut 9, the motors being alternately switched on and off by means of limit switches arranged similarly to those shown in FIGS. 3 and 6.

Turning now to FIG. 5 there are shown diagrammatically two positions of a patient 14 lying on the bed described above. In the medial position of the carrier frame 2 the patient 14 is lying on his back support by the web of canvas 5. In the tilted position shown it will be noted that the patient 14 is well supported from sliding off the bed sideways, by means of the deformation of the web 5, whilst the pressure bearing part of the patient's anatomy becomes his right side and right shoulder indicated by the arrow, rather than his back. This lateral support exists throughout the operational range of pivotal movement of the carrier frame 2, i.e. between the two extremes of angular displacement.

The shifting of pressure on the patient's body will thus eliminate or at least substantially reduce the risk of onset of bed sores.

The carrier frame 2 may also be turned manually, after appropriate disengagement of the drive means, and may be fixed in any desired position by fastening means provided for securing a further rigidly connected arm 15 to an arcuate metal plate 16 rigidly mounted on the base frame 1.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. A bed comprising a base structure, an elongate carrier structure arranged to be supported by said base structure for pivotal movement relative thereto about an axis substantially parallel to the length of the carrier structure, and power-operated driving means for oscillating the carrier structure about said axis between predetermined limits, the carrier structure having at least one web of flexible sheet material loosely hung across it to provide a slack support for the body of a patient lying lengthways of the carrier structure, which web supports a patient's weight via successively different parts of his anatomy as the carrier structure is oscillated.

2. A bed according to claim 1, in which the power operated driving means incorporates means for automatically reversing the direction of movement of the carrier structure each time that it reaches a limit of its pivotal movement.

3. A bed according to claim 2, in which said reversing means comprises automatic limit switches.

4. A bed according to claim 1 in which the web is hung between the two long sides of a substantially rectangular frame constituting the said carrier structure.

5. A bed according to claim 1 in which the said operated driving means for oscillating the carrier structure includes a lever arm rigidly connected to the said struc-

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ture, the arm being in driving connection with an electric motor.

6. A bed according to claim 5, in which the said driving connection comprises a nut pivotally and slidably associated with the arm and carried on a screw driven by said electric motor, such screw extending transversely of the axis of pivotal movement of the carrier structure.

7. A bed according to claim 6 in which the power operated driving means incorporates automatic limit switches for reversing the direction of movement of the carrier structure each time it reaches a limit of its pivotal movement, said limit switches being provided adjacent the screw for engagement by the nut when it reaches the respective ends of its travel corresponding to the maximum angular displacement of the carrier structure, such switches being coupled to the electric motor for reversing its direction of rotation on actuation of the switches.

8. A bed according to claim 1 in which said power-operated driving means includes a lever arm rigidly connected to the said carrier structure, such arm being mechanically connected to a crank mounted on a wheel arranged to be continuously driven in one sense by an electric motor, to turn the carrier structure continuously to and fro.

9. A bed according to claim 1 in which the carrier structure is automatically movable stepwise through a succession of positions between its limit positions.

10. A bed according to claim 1, in which means provided for manually locking the carrier structure comprises an arcuate metal plate rigidly fixed to the base structure and a further lever arm fixedly connected to the carrier structure and registering with said plate, fastening means being provided for securing said further arm to said plate in any of a number of different positions of said carrier structure.

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