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ADJUSTABLE FOOT REST FOR POLIO BED PATIENTS

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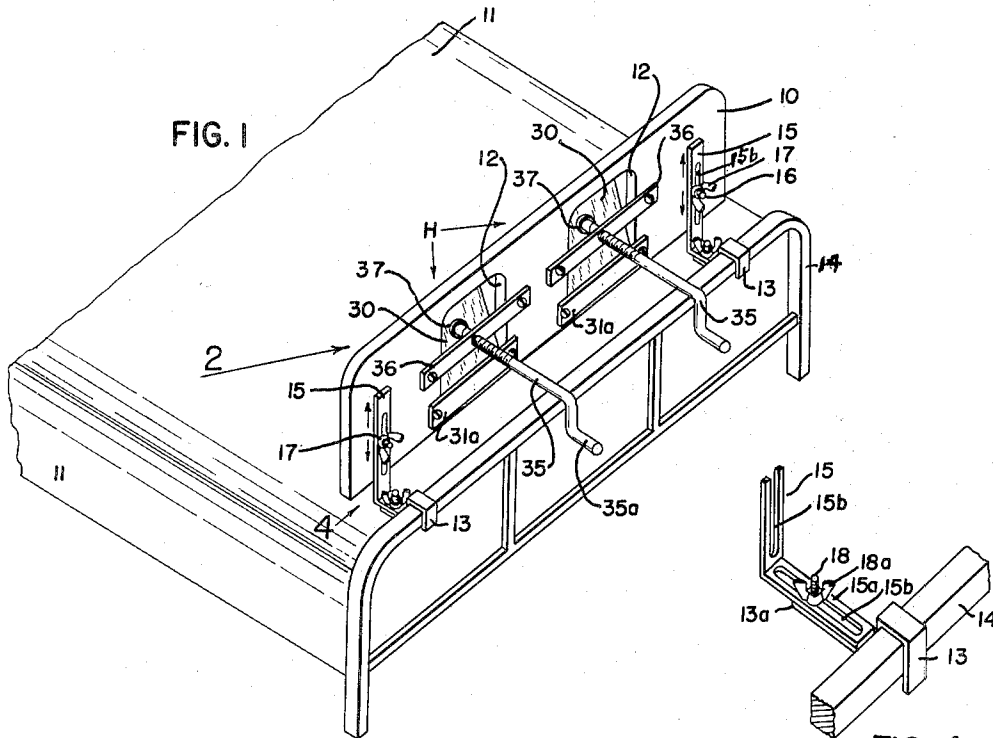


FIG. 1

FIG. 4

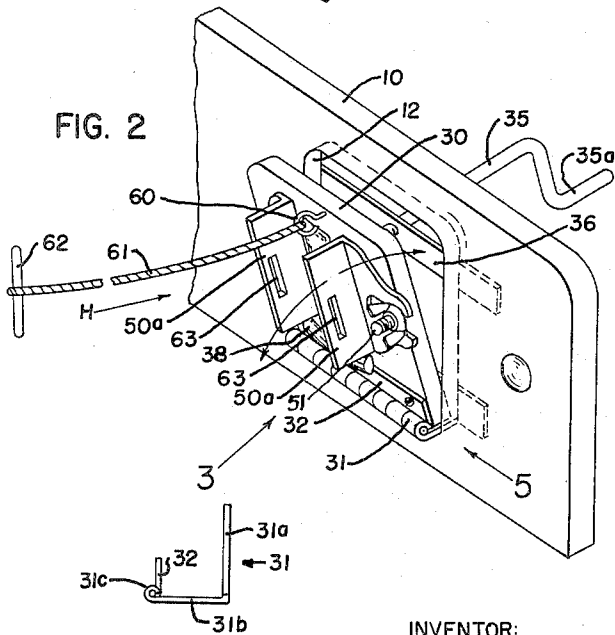


FIG. 2

FIG. 5

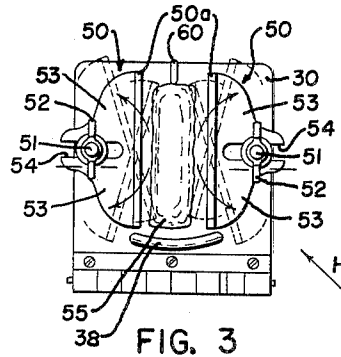


FIG. 3

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ADJUSTABLE FOOT REST FOR POLIO BED PATIENTS

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Infantile paralysis, or commonly called polio, in humans, causes a relaxation of the posterior leg muscles, when that portion of the body is affected, thus causing the foot to fall, so to speak, without muscle support, known as dorsi-flexion. During the bed convalescent immobility stage, to overcome that dorsi-flexion, the patient's leg and foot must be held in a position to cause and keep a near normal amount of muscle tone at all times, by causing the foot to be held in a plane, generally transversely of the longitudinal axis of the leg, and more specifically which plane is tilted upwardly, or toward the patient's head, as the case may in severe cases require; and, also, during that immobility bed confinement stage, lack of muscle support will cause the patient's leg to rotate or flop to one side or the other, and to correct that faulty rotation, and danger of deformity to the ankle, knee and hip resulting therefrom, the patient's leg and foot must be held from so rotating, when in bed, with the toes straight up. Heretofore, so far as known, the only method employed to overcome such dorsi-flexion condition, in a polio bed patient, has been by use of sand bags and such supports laid in the bed.

It is a principal object of this invention to provide an adjustable board attachment, which may be attached to the patient's bed, adapted to provide the desired angular foot support, and also the desired anti-rotation foot and leg support, as just explained, and capable of variation as the case may require.

Another object is the provision of such a board in the form of a removable foot rest, capable of being attached to any hospital bed having a rear upright bedstead portion.

Other and further objects will be apparent from the following description and the drawings, in which:

Figure 1 is a rear perspective elevational view of a bed having my adjustable foot board attached to the rear upright frame thereof;

Figure 2 is a partial enlarged front perspective elevational view of the adjustable foot-holding unit of my board;

Figure 3 is a front elevational view of my adjustable foot-holding unit;

Figure 4 is a partial enlarged perspective view of the adjustable means I employ to attach my novel board to the rear upright bed frame; and

Figure 5 is an enlarged end view of the hinge means I use for attaching each of my foot-holding units to the board.

Throughout the drawings like reference characters have been used to represent like parts.

I provide a board 10, about the width of the bed 11, and make two spaced apart openings 12 centrally of the board, as shown. Board 10 is adjustably and rigidly secured to the rear bedstead upright frame. Spring clamp 13 is removably placed over the top horizontal bed frame bar 14, and acts to hold the board thereto, by being secured to the horizontal portion 15a of a right-angular metal strap 15, and the upright portion of 15

being adjustably secured to the board, as illustrated. Portion 15, secured to the board 10, is slotted and has a bolt 16 extending therethrough and a screw nut on the bolt, for drawing the member 15 tightly against the board 10. Spring clamp 13 also has a horizontal portion and it is slotted, for cooperating with the horizontal portion of the right-angular member 15 and the latter portion of 15 is also slotted. A screw bolt 18, having screw-nut 18a, extends through aligned slots 13b and 15b, of members 13a and 15a, respectively, and is designed to removably hold the two together and to permit adjustment of the distance the board 10 is held away from the bed rear frame, to accommodate for the length of a bed patient. Slot 15b is provided in each of the members 15, at each end of the board 10, so that the board may be raised or lowered, with relation to the bed and also for traction effect on the patient's leg muscles, as will be more fully explained. In adjusting the vertical height of the board 10, both nuts 17 are loosened and the board adjusted vertically in a horizontal plane and then the nuts are tightened to hold the board in position.

Openings 12 are of identical size, and as each have identical foot holding units therein, indicated generally as H, I will now explain the construction and operation of one of them, it being understood that each is independent of the other. I construct a door-like member 30 hinged at its lower edge, by segmented strap hinge 31, and normally adapted to seat within and flush with the opening 12, and having said hinge secured to the lower edge of that opening 12, as illustrated, and to swing in an arc forwardly of the bed on said hinge and board, as indicated in Fig. 2. To control such swinging of door 30, adjustably and securely, at any point in such arc movement on its hinge, I provide a conventional crank screw-worm gear 35 screw meshing through an internally threaded apertured bar nut-like member 36. Member 36 is suitably secured across the back side of opening 12, as by wood screws, as illustrated. The end opposite the crank of member 35 is formed into a ball-like enlargement, and is held in a conventional trunnion-like socket 37 secured, as illustrated, to the side of the door 30 adjacent the bar 36. It will be evident, by this construction, that a turning of the crank member 35, by its crank handle 35a, in the screw-opening provided in bar 36, will in turn cause the door 30 to swing on its pivot 31, as indicated by the arrows of Figure 2. A heel rest 38 for the patient's heel to rest on is secured to the lower center of the door 30, on the side thereof opposite the crank 35. I provide a strap hinge 31 for so hinging the door 30, consisting of a door-stop bar 31a, secured to the crank side of the board 10 across the opening 12, having a right-angularly formed portion 31b which extends through the bottom of opening 12 to the front side of the board 10, with that front portion extended and bent upwardly to form the hinge 31c as shown in Figure 5. When the patient is lying face up on the bed, with his foot resting on heel support 38, a turning of the crank 35 to cause the door 30 to swing forwardly of the bed, as illustrated, with the patient's heel pressed against the lower portion of that door, will cause the patient's foot to be held in an angle from the vertical toward the patient's head, thus causing a stretching of the muscle and tendon of the leg for preventing a deformity thereof, as explained.

To further prevent leg deformity, due to a rotation of the entire leg, I provide a pair of spaced apart identical opposing foot supports 50, each rigidly secured, by an adjustable pivot bolt means 51, to the front side of the door, or toward the head of the bed. Each foot support member 50 is designed to hold the patient's foot from rotating, by holding the foot therebetween, and thereby preventing a leg rotation on the hip joint. A member

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50 comprises a flat flange portion 53 having a slotted web portion 54. A screw bolt 51 and wing nut 52, of conventional screw type, act to adjustably and rigidly secure the flange portion 53 to the door 30. When the wing nut 52 is loosened, the member 50 may be moved horizontally to vary the distance between it and its companion member 50, to accommodate different size feet; and also, as indicated in dotted lines of Fig. 3, the member 50 may be adjusted pivotally on the bolt 51 as a pivot, and in which event its companion member 50 is so similarly angularly adjusted, for reason to be explained. Member 50 has a right angular projection 50a protruding from 53, as illustrated, which projection acts as a side support for the patient's foot, to keep the foot confined between companion opposing members 50 to thereby prevent rotation of the leg, by the foot holding the leg from rotating when the foot is placed therebetween.

The normal tendency, in polio cases, is for the patient's leg to turn outwardly, and, as viewed when the patient is erect, for the foot to flop down or hang with the front of the foot dragging the ground. My device is adapted to prevent such results, and which results are commonly called "drop-foot." That result comes from paralysis of the dorsal flexor muscles.

My device is not to be construed as being confined to use with post-polio patients, as other diseases call for its use. Patients afflicted with encephalitis, the hemiplegics or paraplegics, and those paralyzed due to traumatic injuries to the neuro-muscular mechanism of the lower limbs, have the same problem and need the same bed leg and foot support convalescent care.

By the use of my foot board, dorsiflexion and plantar flexion can be controlled, by holding the foot in a so-called normal standing position while in bed; near normal muscle tone on the posterior muscles of the leg and thigh may be maintained, while in bed, to prevent contractures; and normal rotation of the leg and foot may be maintained, while in bed; all during the convalescent bed period, so that when the patient starts to walk again he will be free from the abnormalities mentioned. Attention is called, during the use of my novel foot board, to the co-action between the hinged foot door 30, capable of being swung on its pivot forwardly, and the adjustable elevation of the entire board 10, by means of the slotted member 15-15b and its lock nut 17; meaning, with any given adjustment of that door, the muscle tone traction on the posterior muscles of the leg, with the patient's heel on the heel rest 38, will be accentuated by a raising adjustment of the board and resetting of the nuts 17, if desired. By muscle tone is meant, traction of that muscle, as last used.

I place a pad 55 centrally of the foot door 30, as illustrated, to ease the pressure of the foot thereagainst. Opposing slot openings 63 are provided in the foot side projection support portion 50a, so that a so-called ankle strap may be placed therethrough and placed across the instep of the patient's foot (strap is not illustrated), to hold the foot firmly with the under surface of the patient's foot pressed firmly against the door 30 with the patient's heel on the heel rest 38, as will be understood.

The purpose of the adjustable foot side supports, 50, on the bed side of the doors 30, is to provide side foot support means for maintaining exactly the side rotational degree or position in which it is necessary to hold the patient's foot, to prevent deformity, as heretofore explained. In certain cases, over-correction, for an already present condition, is required, meaning, of rotation of the foot with its lower leg on the longitudinal axis of the leg on the hip pivot, to bring the big toe and knee and hip joint back in alignment. By over-correction is meant rotation in the reverse direction from that condition as exists in the patient.

I also provide means whereby the patient may exercise his feet and legs, while his feet are held against the bed side of the novel pair of adjustable foot doors 30, just

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described, in the form of a cord eyelet secured, as illustrated at 60, to the bedside of the top central portion of each door 30, to which a cord 61 is attached, and a handle 62 is secured to the end of the cord opposite eyelet 60, for grasping by the patient. The cord is adjustable in length, so that the handle 62 may be grasped, when desired, by the patient. By grasping the handle 62, the bed patient may exert a little pull on his foot, held against the door 30, sufficient to enable him to be able to exercise the muscles of his foot and leg, transmitting that so-called pull through the cord and door 30 to his foot, which he otherwise might not be able to do.

By my novel device for holding the foot, in terms of angle of the sole of the patient's foot with relation to the longitudinal axis of his leg, and also in terms of the rotation of his foot and thereby his lower leg with relation to his hip socket and on the longitudinal axis of his leg as a pivot, during bed confinement of the patient, I provide basic therapeutic means for preventing so-called drop-foot in such a patient; and by use of my novel cord attachment exercise during such bed confinement, being an active therapeutic measure, the bed confinement and recuperative period of the patient is considerably shortened, when his muscles will be returned substantially to normal so that he may have the use of his legs or leg again. Much labor, time saving and efficiency in accomplishing such therapeutic measures by my novel device, results, over the heretofore, as far as known, methods of using sand bags to prop the patient's legs and feet, orange boxes weighted, placing the affected portions in a cast, propping up with boards, with all of the latter resulting in all probability in crippling or deformity.

It is to be understood that many changes and modifications may be made in the preferred embodiment of my invention, herein described in detail and illustrated, and, therefore, I wish to be limited in the scope of my invention only by the hereunto appended claims.

What I claim and desire to secure by Letters Patent is:

1. An adjustable foot rest for paralyzed bed patients having dorsiflexion and plantar flexion, comprising, in combination, a board having two openings and adapted to be vertically positioned and removably secured to and carried by the rear bed frame, spring-clamp means on the board for so removably securing the board to the rear frame of the bed, right-angular strap means with each side thereof having a slot and attached to and cooperating with said securing means and adapted for adjusting the board horizontally and forwardly and vertically of said rear frame, a pair of foot doors with each one thereof hinged at its lower edge to the lower edge of one of said openings and each one being adapted to fit within the opening to which hinged and to swing forwardly of the bed on its hinge, separate hinge means for so hinging each door, a heel pad secured to the front side of a door on the forward bed side thereof, a pair of screw crank means with one thereof connected to one door and carried by the board adjacent an opening and the other thereof connected to the other door and carried by the board adjacent an opening and each crank means adapted independently to adjustably and securely swing its door on its hinge pivot forwardly of the bed, a plurality of pairs of anti-rotation foot side-support holding means with each of the members of a pair being removably pivotally and rigidly secured to the forward bedside surface of a door, said anti-rotation foot side-support holding means comprising a pair of right-angularly cross-sectionally spaced-apart opposing individually pivotally adjustable foot side support members adapted to permit the patient's foot to press against their door and be confined between them, each of said foot side support members of a pair thereof being adapted to be adjustably secured to its door in any position of an arc on a pivot point, separate means carried by each door for so securing each of said foot side-support members of a pair thereof individually on a pivot point to said surface of that door, each door having

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a foot pad secured to its surface between said foot side support members, glue-like means securing each pad thereto, each of said foot side support members being adapted for adjustment thereof to vary the distance between a pair thereof, each of the foot side-support members of a pair thereof having a slot means cooperating with the means for the pivot point securement thereof and adapted for accomplishing said variation of the distance between a pair thereof, an exercise cord secured to a door of the board and having a handle attached to the end of the cord opposite the door, said cord being of a length adapted to permit the patient having his foot resting against that door to exert attempted pulling pressure exertion through the handle and cord for assisting the patient in exerting active therapeutic leg and foot muscle exertion while the patient's foot is so resting against the door, and each of the foot side support members of a pair of anti-rotation foot holding means having a slot formed therein adapted to receive a foot holding strap therethrough.

2. A therapeutic device for bed patients having dorsiflexion and plantar flexion, comprising, in combination, a vertical foot board having an opening therein and being adjustably secured to the foot of the patient's bed, means carried by the board and adapted to cooperate with the foot of the bed for so securing and adjusting the board horizontally and vertically with relation to the top surface of the bed, a hinged door in said opening and being adapted to swing on its hinge forwardly of the bed, means secured to the lower parts of each of said opening and door for so hinging the door, a heel rest secured to the forward bed side of the door and being adapted to permit the patient's heel of one of his feet to rest thereon, and adjustable screw-crank means carried by and between said door and the board for securely altering the position of the door on its hinge and in an arc in direction forwardly of the bed, said vertical raising adjustment means of the board and forward swinging adjustment means of the door on its hinge when the patient's heel is resting on said heel rest together comprise traction means for causing traction of the patient's leg muscles of the leg having the heel so resting on said heel rest upon a vertical raising of the board and a forwardly of the bed swinging of the door.

3. In a device of the class described, in combination, a vertical foot board having an opening therein and being adjustably secured to the foot of a patient's bed, means carried by the board for so securing the board to the bed and also including means for both vertical and horizontal adjustments of the board in independent relationship of adjustments, a door adapted to fit within said opening and being hingedly secured adjacent an edge of the opening to the board and being adapted to swing on its hinge forwardly of the bed, means secured to the lower edge of the door and to the board for effecting said hinge securement of the door to the board and adapting the door to swing forwardly of the bed, adjustable screw crank means carried by the board and being pivotally associated with the door for effecting such swinging of the door on its hinge and for holding the door in any so adjusted position on its hinge, and anti-rotation foot holding means adjustably secured to the face of the door on the forward

bed side thereof for adjustably holding the patient's leg by its foot against rotation when the patient's foot is against that side of the door, and separate pivot means secured to the door for so adjustably securing the anti-rotation means to said door face.

4. A device of the class described, for therapeutically treating a patient whose leg and foot have been paralyzed in a bed having a frame and a mattress, by causing dorsiflexion and plantar flexion of the muscles of the patient's leg, comprising, means adapted to be adjustably secured to the bed frame for adjustably holding the patient's foot so that the angle of the plane of the bottom of the foot with relation to the longitudinal axis of the patient's leg of that foot may be variably held as either a right angle thereto or in any desired angular relationship of less than a right angle thereto and toward the patient's head, and adjustable anti-rotation means carried by the first named means for holding the patient's leg of that foot by said foot against rotation in any desired rotational position thereof on the longitudinal axis of that leg in its hip socket as a pivot, said last named means cooperating with said first named means.

5. In a therapeutic device for bed patients having dorsiflexion and plantar flexion, in combination with a foot board adjustably secured to the foot of the patient's bed and having a foot door adapted to permit the patient's foot to rest thereagainst and being adjustably pivotally secured to said board, the combination of a heel support member secured to the forward bed side of said door and adapted to permit the patient's foot to rest by the heel thereon, and a spaced apart pair of foot side-support holding members each rigidly secured in pivot-adjustable relationship to the door and each positioned above the heel support member and adapted to be positioned each against and on a side of the patient's foot resting on said heel support member, identical pivot-securement means for so rigidly and pivot-adjustably securing each of the foot side-support holding members to the door, each of said identical securement means including means for adjustment of its foot side-support holding member with relation to the other of said foot side-support holding members to vary the distance between the foot side-support holding members, each of said pivot-securement means being adapted to permit its said foot side-support member to be rotated and rigidly secured to the door in degree from the vertical for thereby adapting the pair of foot side-support holding members to hold the patient's foot by and between them and on the heel support member and against the door in any desired side-rotational position of the patient's foot and leg on the hip socket of that leg as a pivot.

References Cited in the file of this patent

UNITED STATES PATENTS

| | | |
|-----------|---------------|---------------|
| 9,472 | Hussey ----- | Dec. 14, 1852 |
| 2,465,781 | Banta ----- | Mar. 29, 1949 |
| 2,664,886 | Coffman ----- | Jan. 5, 1954 |

FOREIGN PATENTS

| | | |
|---------|---------------------|---------------|
| 104,838 | Great Britain ----- | Mar. 22, 1917 |
| 499,930 | Belgium ----- | Mar. 31, 1951 |