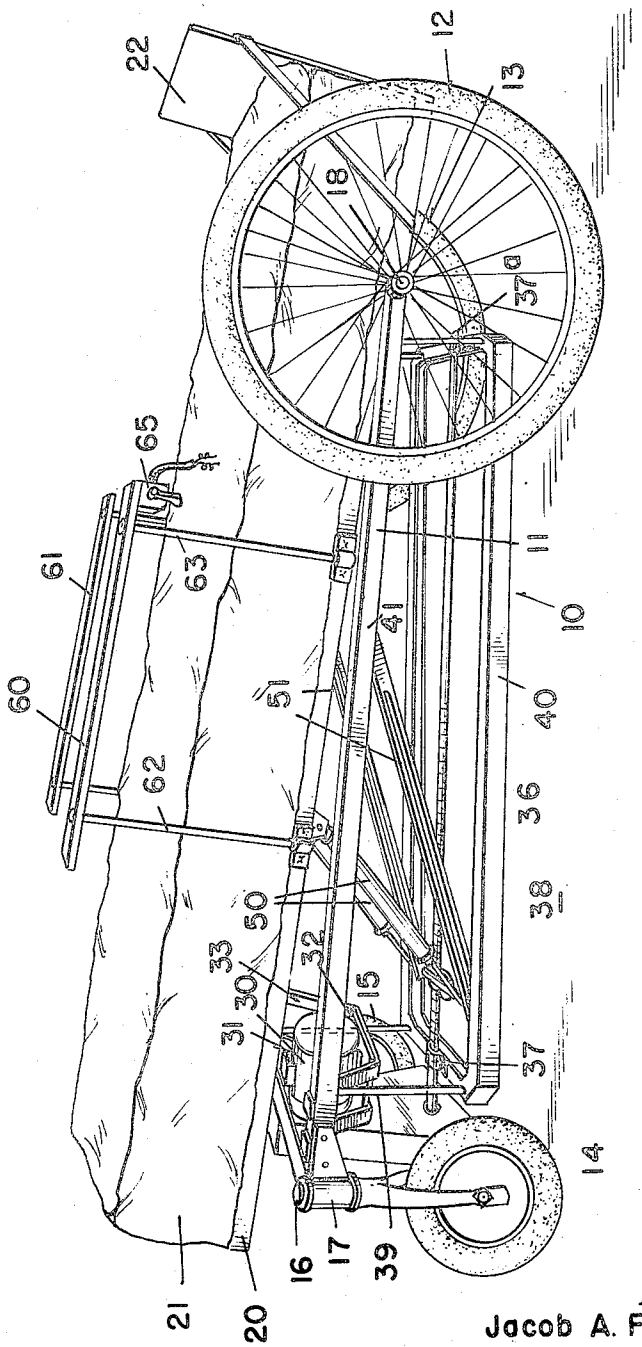
Oct. 17, 1950 J. A. FRIESEN 2,526,466

INVALID SUPPORT

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FIG. 1



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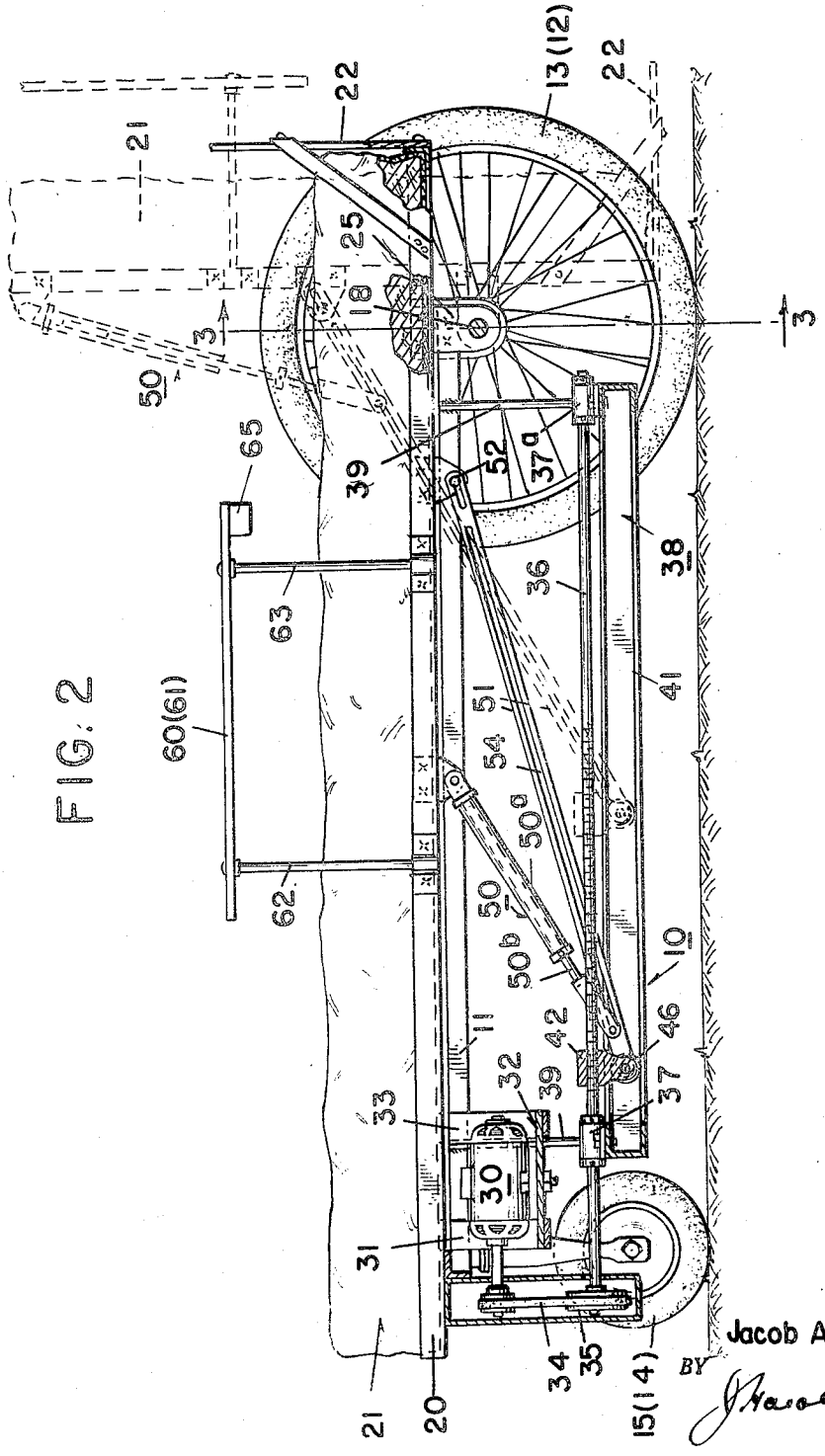


FIG. 2

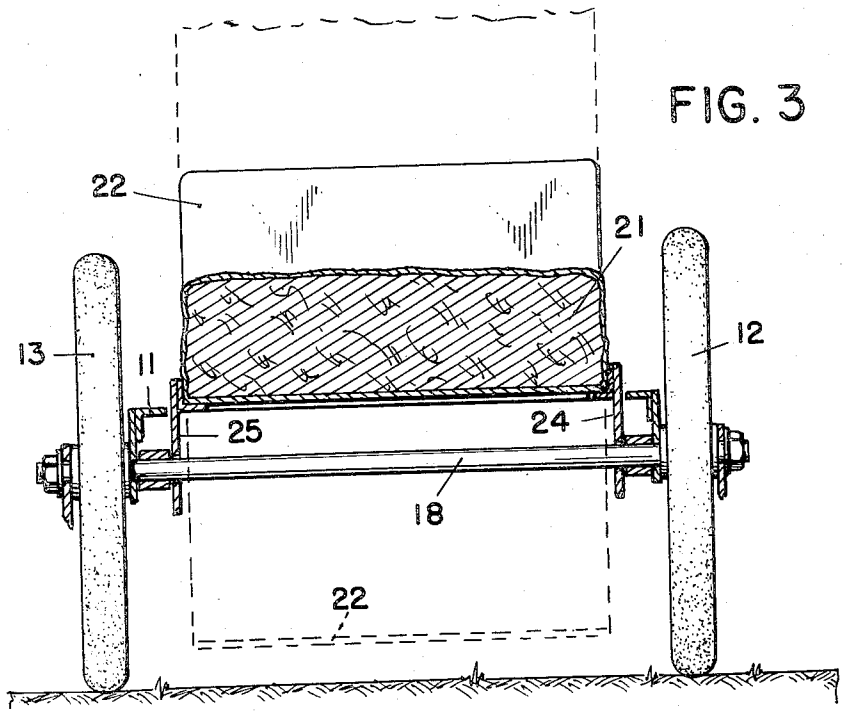
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FIG. 3



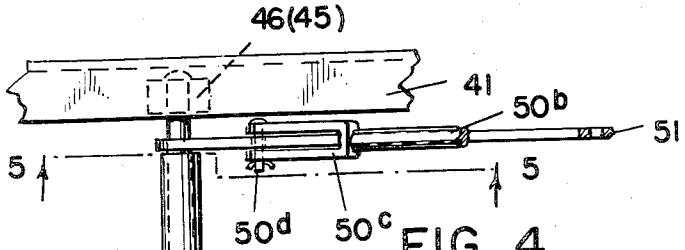


FIG. 4

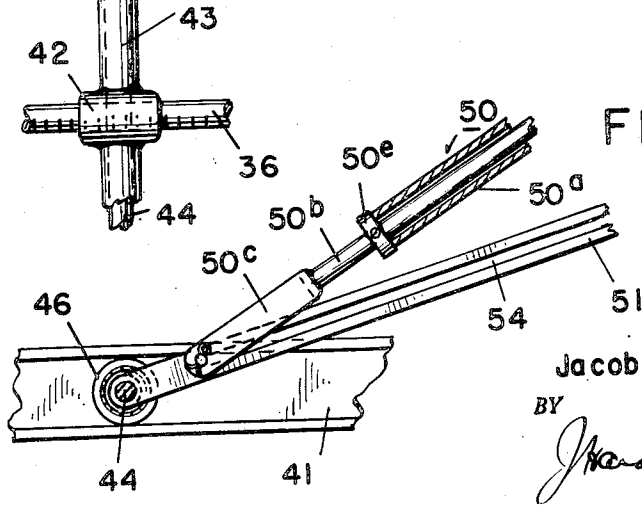


FIG. 5

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Patented Oct. 17, 1950 2,526,466

UNITED STATES PATENT OFFICE

2,526,466

INVALID SUPPORT

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Application December 31, 1947, Serial No. 795,077

6 Claims. (Cl. 5—62)

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This invention relates to improvements in invalid supports and more particularly to a wheel-about tilting type of support designed for use by invalids or injured persons who through spine injury or disease are immobilized at the hips or waist and thus are unable to raise themselves from a prone or horizontal to an upright position and/or to lower themselves to a prone position. Although illustrated in the form of an invalid's bed, it is to be understood that a support of the character contemplated by the present invention is also adaptable to numerous other uses, for example, as a wheeled stretcher or as a wheel-chair.

Broadly stated, the invention contemplates and aims to provide a highly mobile type of tiltable invalid support in the form of a bed-like structure incorporating power means for tilting the bed or mattress frame thereof about a transverse axis from a substantially horizontal to a substantially vertical position and back to the horizontal position, whereby a patient lying thereon may be brought to upright position or returned from an upright to a prone position. A further general object is to provide a tilt-type invalid support wherein power means under the control of the patient are provided for tilting the bed frame from and to a substantially horizontal position.

More specifically, the invention aims to provide an improved tilting mechanism for invalid beds or supports which is characterized by simple construction and highly effective operation, and which may be readily controlled by an invalid lying thereon.

Yet another object of the invention is the provision of a power-actuated tilting bed form of support for invalids and others who are unable to raise themselves from a prone to an upright position, which may be inexpensively manufactured, in which tilting motion is under the control of the patient, and which is sufficiently light in weight and mobile that it may be readily wheeled about from place to place.

Other objects and features of advantage of the present invention will be in part obvious and in part apparent from the following detailed description thereof, taken with the accompanying drawings illustrating a preferred form of invalid support according to the invention, in which

Fig. 1 is a perspective view of an improved invalid's support as herein contemplated, the bed frame being in slightly tilted position relative to carriage to show underneath construction;

Fig. 2 is a longitudinal section taken through the invalid's support shown in Fig. 1, the view

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illustrating in dotted lines the bed frame tilted to vertical position;

Fig. 3 is a transverse section taken along lines 3—3 of Fig. 2; and

Figs. 4 and 5 are, respectively, plan and side elevational detail views illustrating the sliding or shifting connection between the angularly related links of the tilting mechanism.

Referring to the drawings wherein like reference characters designate like parts throughout the several views, reference character 10 generally designates a wheeled carriage including a skeletal rectangular frame 11 which is supported at its foot end as by a pair of bicycle wheels 12, 13 turning on a fixed axis extending across the frame, and at its head end by a pair of castering wheels 14, 15 whose mounting spindles turn in bearings 16 contained in brackets such as 17 by which each castering wheel assembly is secured to the carriage frame. The foot end supporting wheels 12, 13 may be mounted on a cross axle 18 (Fig. 2) or they may be individually mounted on stub axles affixed to the carriage frame.

Supported on the wheeled carriage is the bed proper which may consist of a rectangular spring and mattress frame 20, to be hereinafter referred to as a bed frame, on which is placed a mattress 21. Secured to the foot end of the frame 20 is a suitably braced upright foot board 22 of height both to hold the mattress when the bed frame has been tilted to or close to vertical position, and also to provide a stand-plate on which the patient may support his or her weight as the bed is being tilted upwardly and during lowering. By reference to Fig. 3, the foot end of the bed frame 20 is pivotally connected to the carriage frame 10, and preferably to the axle 18 thereof, by means of depending brackets 24, 25, as shown. The head end of the bed frame is supported from the tilting mechanism to be described.

According to the invention, power means under the control of the patient are provided for tilting the bed frame upwardly relative to carriage frame from a substantially horizontal to a substantially vertical position and for lowering the bed frame from substantially vertical to substantially horizontal position. Referring to Figs. 1 and 2, said power means incorporates a power source such as a reversible electric motor 30 shown to be mounted in a supporting framework 31, 32, 33 adjacent the head end of the carriage, and preferably between and below the level of the longitudinal side members thereof. Through a belt and pulley drive connection 34, 35, the motor drives a worm shaft 36 extending longitudinally

beneath the carriage frame, the worm shaft being supported in suitable end bearings **37**, **37***a* carried by a rectangular sub-frame generally designated **38**, which is hung from the carriage frame by corner hang rods **39**.

As seen in Figs. 4 and 5, the side members **40**, **41** of the sub-frame are of channel section, with the channels facing inwardly. Mounted on the worm shaft **36** is a worm nut **42** which is welded or otherwise affixed to a transversely extending sleeve **43**, through which extends a cross bar member **44**. The ends of the cross bar carry supporting rollers **45**, **46** which track in the channels of the side members **40**, **41** of the sub-frame, said side members thus functioning as longitudinal confining rails for the rollers.

Referring to Figs. 2, 4 and 5, a linkage system operative between the cross bar **44** and the bed frame **20** functions to translate linear travel of the worm nut **42** on the worm shaft **36** in the direction of the foot end of the bed into raising movement of the bed frame, and reverse linear movement of the nut along the worm shaft into lowering movement of the bed frame. According to the invention, said linkage system includes side pairs of angularly related and downwardly converging lifting links generally designated **50** and **51**, of which the main lifting link **51** of each pair is connected at its lower end to the cross bar **44** adjacent an outer end thereof. At its upper end each link **51** has a lost motion connection with the corresponding side member of the bed frame **20** as provided by a pin **52** carried by the side member and a short length slot **53** formed in the upper end of the link. Said pin and slot connection permits the link **51** to shorten by the length of its slot **53**, as its lower end moves with the cross bar **44** toward the foot end of the frame, and to lengthen by a corresponding amount as said lower end moved in the opposite direction.

The other link **50** of each side pair thereof may be of extensible or telescoping construction, and, as shown, comprises a tube **50***a* which is pivotally connected at its upper end to the side member of the bed frame, and slidably mounts a rod **50***b* whose lower end is formed as a forked head **50***c* mounting a cross pin **50***d* operating in a slot **54** formed in the companion main link **51**. A fixed collar or nut **50***e* carried by the rod **50***b* of the telescoping link forms an abutment for the tube **50***a* thereof which limits contraction of said link in excess of a length necessary to the bed frame assuming a horizontal position. Accordingly, with the bed frame in lowered or horizontal position, the telescoping links **50**, through engagement of their cross pins **50***d* with the lower ends of the slots **54** and of their stop collars **50***e* with the lower ends of the tubes **50***a*, are conditioned to act as push links between cross member **44** and the bed frame.

By further reference to Fig. 2, it will be observed that the telescopic links **50** are connected at their upper ends to the bed frame at points which are substantially spaced rearwardly or in the direction of the head end of the bed frame from the points of connection of the upper ends of the link **51** with said bed frame. Accordingly, in the normal or horizontal position of the bed frame, telescopic links **50** have greater inclination than the links **51** and hence are more favorably disposed to exert an initial tilting force to the bed frame than are the longer links **51** which by reason of their greater length and rearward points of connection with the bed frame have substantially lesser inclination.

Utilization of this favorable inclination of the telescoping links to effect initial raising movement of the bed frame results from the above described shiftable pin and slot connection of the lower ends of the links **50**, **51** in conjunction with the aforementioned lost motion connection between upper ends of links **51** with the bed frame. Thus, initial travel of worm nut **42** in forward or foot-end direction consequent to rotation in proper direction of the worm shaft **36** results in bodily travel of the cross member **44** in similar direction. This latter motion is transmitted to the lower ends of the main lifting links **51**, but since their upper ends have a lost motion connection with the bed frame, the initial motion transmitted to the lower ends of the main links is transmitted by cross pins **50***d* to the lower ends of the telescoping links **50** which now function as fixed-length push links in initiating raising movement of the bed frame.

As the ends of the links **51** move with the cross member **44**, the favorable inclination of the telescoping links **50** decreases as said links approach the vertical and the inclination of the links **51** increases to a degree where they are favorably disposed to taking over the lifting action of the telescopic link **50**. To achieve same, the length of the lost motion slots **53** is such that pins **52** abut against the lower ends of said slots just prior to the telescopic links reaching their vertical or dead center position. Hence, as further longitudinal travel of the worm nut proceeds, such is now translated into lifting action on the bed frame only by the main lifting links **51** which complete the lifting action, during which operation the telescopic links extend and their lower ends shift along the length of the slots **54** provided in the links **51**, so that they interpose no interference to the free lifting action of the main lifting links **51**.

Upon the bed frame being eventually tilted to vertical position, further rotation of the worm shaft **36** is interrupted as by cutting out the motor **30**. With the patient lying on the bed brought to upright position, he or she may now step off the foot stand **22**. It will be observed that the tilting motion of the bed has raised the patient from a prone to an upright position without any physical effort except to cut the motor in and out and without any requirement of the patient to bend at the hips or waist.

When a patient desires to be lowered from an upright to a prone position, and assuming the bed frame to be in vertical or substantially vertical position, he is merely required to step on the foot stand **22** and to reverse the operation of motor **30**. Such effects reverse rotation of the worm shaft **36** and travel of the worm nut **42** towards the head end of the carriage and bed frame. In the lowering operation, the aforesaid linkage system operates generally as described but in reverse. To this end, the telescoping links **50** are designed to reach the limit of their extension, and their cross pins **50***d* to engage the upper ends of the slots **54** in the main lifting links **51**, when the bed frame is in full vertical position. The initial reverse travel of the worm nut is transmitted to the lower end of the main link **51**, but due to their pin and slot connection with the bed frame, said links elongate for the length of their slots **53**. During such elongation, the telescopic links act as pull links and exert an initial lowering force to the bed frame. Upon the main links **51** extending to their full length, as occurs when pins **52** engage against the upper

ends of their slots 53, they take over the lowering action initiated by links 50, said latter links now contracting during the continued lowering movement. Upon the bed frame being lowered to its substantially horizontal position, the telescopic links have shortened to their minimum length and to the extent that their cross pins 50*d* engage against the lower ends of the main link slots 54, whereupon the telescopic links are suitably conditioned to initiate the raising movement of the bed frame on the next actuation of the motor.

To provide for greater security and support of the patient during the raising and lowering operations, the bed frame may be provided with arm rests 60, 61, each supported from upright rods 62, 63 secured at their lower ends to the side members of the bed frame. The rods next adjacent the foot end of the bed frame are preferably positioned so that they may be readily grasped by the hands of the patient being raised or lowered, who may thereby support some of his or her weight from the rods rather than resting it squarely on the foot stand 22.

To enable the patient to control tilting of the bed frame as desired, a reversing switch designated 65 is secured in readily accessible position to one of the aforesaid arm rests 60. The switch 65 is connected in a suitable control circuit (not shown) for the motor 30, which is supplied with current through long length conductors (also not shown) enabling the carriage to be wheeled about a porch or a lawn, for example, with the motor connected to a source of outside current. Suitable limit switches may also be provided to prevent over-travel of the worm nut 42 in either direction.

It is intended that the overall length of the invalid's bed as described shall not exceed that of the ordinary bed, whereby it may be employed and used as would the ordinary bed. Moreover, its width is such that it may pass through the standard-width door frame, so that it may be moved about from place to place in a home or wheeled from the inside to the outside of the home as desired. Due to the castering head wheels 14, 15 and skeleton construction throughout, the bed is highly portable and readily steerable.

Without further analysis, it will be appreciated that the invention achieves the above stated and other desirable objects in providing a highly mobile invalid's support of the tilting type, which enables a patient immobilized at the hips or waist to raise himself or herself to an upright position and, conversely, to lower himself or herself from an upright to a prone position. During the tilting motion of the bed frame, the patient is adequately supported both by a foot stand and by arm supports provided on the bed frame so that he or she is under no danger of slipping from the bed when in an inclined or the vertical position. Moreover, the patient may raise or lower himself or herself as desired without the need of or assistance from an attendant, since the raising and lowering motion is entirely under the patient's control.

In another of its aspects, the invention provides highly effective means for obtaining the aforesaid raising and lowering movements of a bed frame relative to a supporting carriage, which is further characterized by simple and inexpensive construction.

While the foregoing detailed description sets forth the invention in its preferred practical and illustrative form, it is to be understood that the construction shown may be changed and modified within the limits of the appended claims.

I claim:

1. In an invalid support, a wheeled carriage, a frame member pivoted on said carriage for tilting movement about an axis extending transversely across the carriage, and power means mounted on said carriage for effecting tilting movement of the frame member including a longitudinally extending worm shaft, a reversible motor for rotating said shaft in opposite directions, a worm nut mounted for longitudinal travel on the shaft, and a linkage system operative between carriage and frame member and being actuable by the worm nut, said system including a link whose one end is actuable in opposite directions lengthwise of said carriage by said worm nut.

2. In an invalid support, a wheeled carriage, a frame member pivoted on said carriage for tilting movement about an axis extending transversely across the carriage, power means mounted on the carriage for effecting tilting movement to the frame member including a longitudinally extending worm shaft, a reversible motor for rotating said shaft in either direction, a worm nut mounted for longitudinal travel on the worm shaft, a transversely extending member actuable by the worm nut in either direction lengthwise of said carriage, and a pair of lifting and lowering links operative between the transverse member and the frame member.

3. In an invalid support, a wheeled carriage, a frame member pivoted on said carriage for tilting movement about an axis extending transversely across the carriage, and power means mounted on the carriage for tilting the frame member including a pair of links operative between carriage and frame member, and a lost motion connection operative between one end of said links whereby one of the links is operative to initiate the tilting movement and the other link is operative to complete the tilting movement.

4. In an invalid support, a wheeled carriage, a frame member pivoted on said carriage for tilting movement about an axis extending transversely across the carriage, power means mounted on the carriage for tilting the frame member including a pair of angularly related link members connected together at their lower ends and connected at their upper ends to the frame member at points which are spaced from one another along the length thereof whereby one link has greater inclination than the other, and means whereby the link of greater inclination initiates the tilting movement and the link of lesser inclination completes the tilting movement.

5. In an invalid support, a wheeled carriage, a frame member pivoted on said carriage for tilting movement about an axis extending transversely across the carriage, power means mounted on the carriage for tilting the frame member including a pair of angularly related links shiftably connected together at their lower ends and being connected at their upper ends to the frame member at spaced points along the length thereof whereby one link has greater inclination than the other link, the connection between said other link and the frame member providing for limited lost motion travel of said other link, the construction and arrangement being such that the link of greater inclination is effective to initiate the tilting movement during the lost motion

travel of said other link and said other link is effective to complete the tilting movement.

6. In an invalid support, a wheeled carriage, a frame member pivoted on said carriage for tilting movement about an axis extending transversely across the carriage, power means mounted on the carriage for effecting tilting movement of the frame member including a longitudinally extending worm shaft, a reversible motor for rotating said shaft in opposite directions, a worm nut mounted for longitudinal travel on the worm shaft, a transversely extending member actuable by the worm nut, and side pair of angularly related lifting and lowering links of which one link is connected at its lower end to one end of the cross member and has a lost motion connection with the frame member, the other link being extensible and shiftably connected at its lower end to the said one link and pivotally connected at its upper end to the frame member so as to have greater inclination than said one link, the construction and arrangement being such that initial travel of the worm nut in either direction is transmitted through said one link to said other link and continued travel of said worm nut is transmitted only to said one link, whereby said other link initiates the raising and lowering movement of the frame member and said one link completes the raising and lowering movement.

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