

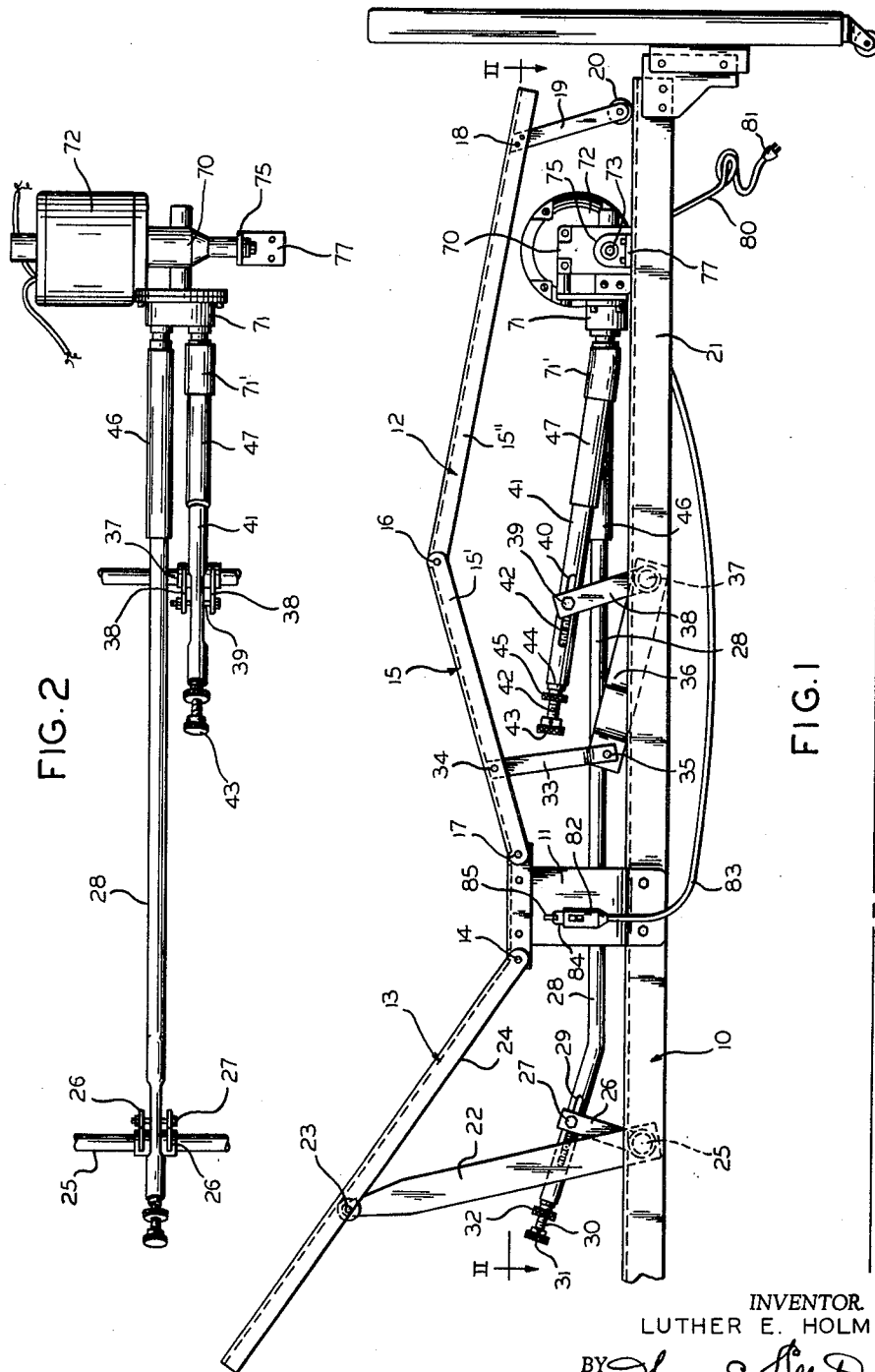
June 29, 1965

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HEAD AND KNEE REST OPERATING DRIVES FOR  
HOSPITAL BEDS AND THE LIKE

3,191,196

Filed Dec. 7, 1962

2 Sheets-Sheet 1



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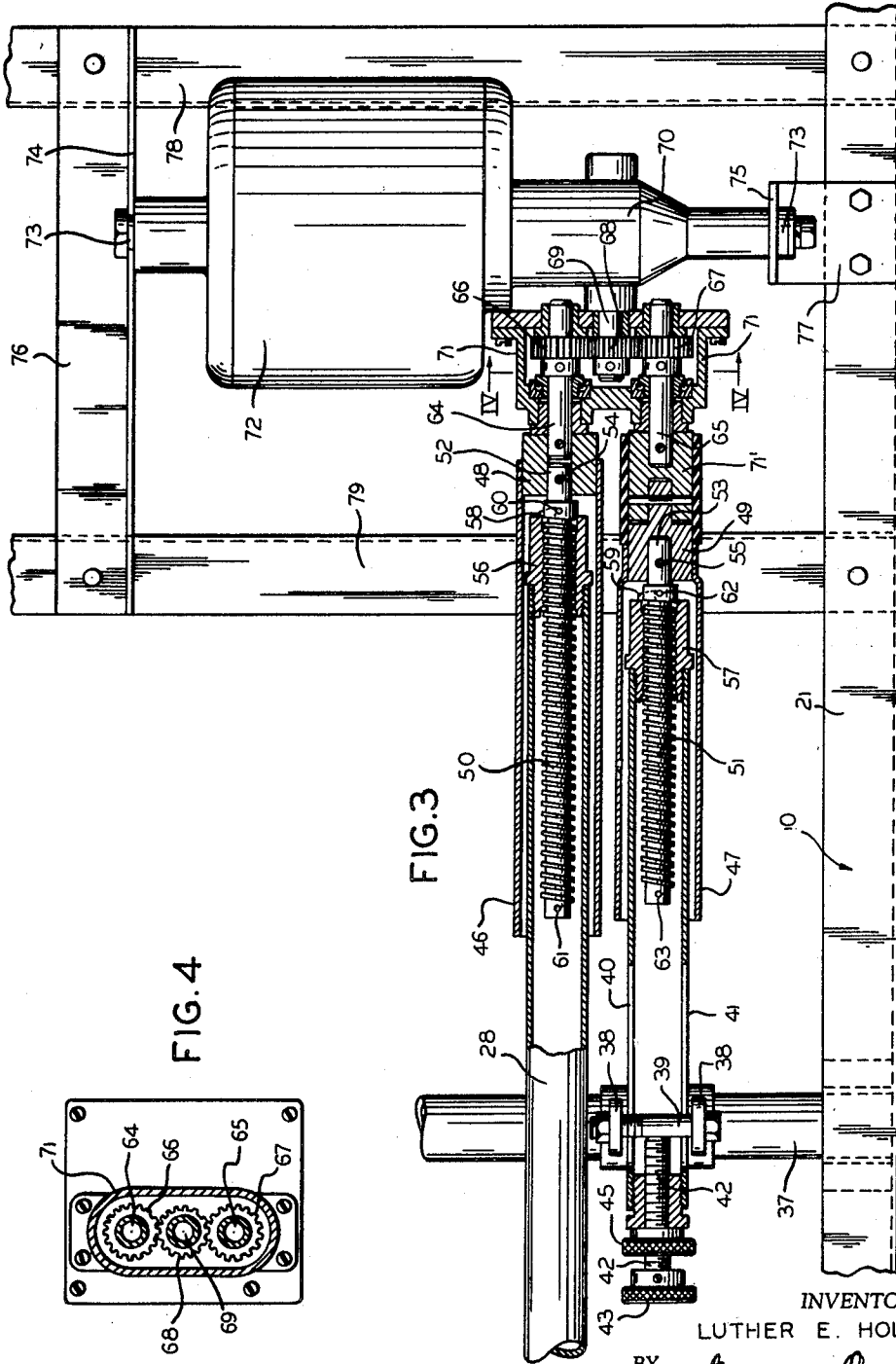
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## HEAD AND KNEE REST OPERATING DRIVES FOR HOSPITAL BEDS AND THE LIKE

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This invention relates to adjusting devices for bed springs and the like, and more particularly to power adjusting and operating instrumentalities for head and knee sections of bed springs, although it and certain features thereof may be used with equal advantage for other purposes.

It contemplates more especially the provision of simplified and less expensive operating instrumentalities which can be used with greater advantage in the home, hostleries, convalescent homes, homes for the aged, hospitals and the like wherein beds are provided or desirable with springs which can be readily manipulated into any of the various positions by the user or attendant for varying the back and knee rest sections to contribute to the comfort of the person in bed.

Many types of bed spring operators have heretofore been proposed including the type set forth and claimed in application Serial No. 217,707 filed August 17, 1962 of which this application is a continuation-in-past and in connection with which improvements have been effected to simplify the operating instrumentalities and the control therefor so that a single control will bring about the varying positions desired by the user or attendant. The action and the control therefor is so simple that even the most feeble and indisposed individual confined to bed, may manipulate the action to the user's own satisfaction without being required to wait for an attendant. This wait during present times of personnel scarcity in hospitals, convalescent homes, old homes, and even in private homes, becomes considerable and taxes the already impaired dispositions of those who are confined to bed for extended periods. With the teachings of the present invention, the comforts of guests in motels, hotels, and resorts may be enhanced with bed instrumentalities embodying features of the present invention.

One object of the present invention is to simplify the construction and improve the operation of devices of the character mentioned.

Another object is to provide improved mechanical drives for head and knee rests of all types of beds wherein brakes, clutches, limit switches and the like are eliminated and providing a sequence of movement responsive to a single control that will vary the head and knee rest positions of bed springs equipped therewith.

Still another object is to provide novel linkage in conjunction with sectional members for raising and lowering same in a predetermined sequence depending upon the command of the attendant or user thereof to accomplish variable relative positioning therebetween.

A further object is to provide a bed spring with pivotal head and knee rest members connected through power driven linkage having adjustable moment arms for controlling the sequence of related head and knee rest positioning.

A still further object is to provide improved and simplified linkage for crank arms having adjustable moment arms therebetween to pivot plural members in controlled sequence for accomplishing the desired positioning thereof.

Still a further object is to provide plural crank arm linkage for various sectionally mounted spring members of a bed or similar supporting device powered to respond to a single command control for raising and lowering

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the bed spring sections in any desired sequence for positioning relative to each other and the bed spring.

Other objects and advantages will appear from the following description of an illustrated embodiment of the present invention.

In the drawings:

FIGURE 1 is a fragmentary front view in elevation of a sectional bed spring member having power operated linkage connected therewith in accordance with the teachings of the present invention.

FIGURE 2 is a top plan view of the linkage and power unit embodied in FIGURE 1, and taken substantially along line II-II of FIGURE 1.

FIGURE 3 is an enlarged fragmentary top plan view of the linkage and power unit shown in FIGURE 2 with parts thereof broken away and shown in section to clarify the details of construction.

FIGURE 4 is a sectional view in elevation of the power gear train taken substantially along line IV-IV of FIGURE 3.

The structure selected for illustration is not intended to serve as a limitation upon the scope or teachings of the invention, but is merely illustrative thereof, and there may be considerable variations and adaptations of all or part of the teachings thereof depending upon the dictates of commercial practice. The present invention comprises in its environmental structure a bed spring frame 10 to which upstanding bracket plates 11 are attached intermediate the ends thereof to support the sections of any suitable bed spring 12. The bed spring 12 is preferably provided with a head rest portion 13 pivotally connected at its lowermost ends 14 to the bracket plates 11. This section 13 usually supports the head and entire thorax of the user who may necessarily be an individual such as a patient at a hospital, convalescent home, home for the aged or, for that matter, a perfectly healthy individual accustomed to or desirous of an adjustable head and knee-rest bed in the home, motel or hotel of the luxury type.

The bed spring knee rest portion 15 usually consists of two pivoted sections 15'-15'' pivotally joined at 16 to each other with their ends pivotally connected and attached as at 17 and 18 to the upstanding bracket 11 and depending levers 19 at the extreme foot-end of the bed frame 12. The levers 19 terminate downwardly in rollers 20 movably supported on the channelled side members 21 of the bed frame 10. The head rest section 13 actually serves as a back rest as well as a head rest so that for purposes of this disclosure and for brevity in description it shall be termed a head rest 13 while the sections 15'-15'' which are pivotally adjustable relative to each other are and shall be collectively termed as a knee rest 15. The head rest 13 serves as either a flat thorax support in its lowermost horizontal position and as a head and back rest in its elevated pivotal positions while the knee rest sections 15'-15'' may assume a rigid flat horizontal position in alignment with the flat lowermost position of the head rest 13 which together with the knee rest 15 normally assumes the position of a rigid flat horizontal bed spring 12 (this position not shown). Both the head rest 13 and the knee rest 15 are adjustable by instrumentalities to be hereinafter described, to assume a large variety of angular positions independent of or relative to each other so that doctors and nurses may treat a large number of different ailments and afflictions as well as position the patient in any number of different appendage relationships for utmost comfort to the patient depending upon the afflictions and the experience of each patient.

This requirement for different positions may vary from time-to-time during short or long intervals of rest or may be found desirable by people who find comfort

in changing their positions for restful relaxation while in bed so that the individual in bed or an attendant should be in a position to control the bed spring contours without any intricate involvement but through a simplified control and automatic action in the pivotal relationship of the head rest 13 and knee rest 15 relative to its initial positions which define a rigid flat horizontal spring 13-15.

To this end, the head rest 13 is supported and actuated pivotally through comparatively long levers 22 on each side thereof which are pivoted at their upper ends as at 23 to the head rest frame side members 24 while the other lever ends are anchored to a stud or shaft 25 journaled in the side members 21 of the bed frame 10. A bell crank lever 26 is attached to the stud or shaft 25 to actuate the latter which, in turn, pivots the comparatively longer lever 22 that, in turn, pivotally adjusts the head rest 13. This is accomplished by providing a pivot pin 27 through the bifurcated bell crank lever or arm 26 to bridge an elongated tubular drive link member 28 which is slotted as at 29 for an appreciable distance to receive the crank arm pin 27 therethrough. To determine the effective adjustable length of the slot 29 and allow the pin 27 to slide therein for any predetermined distance, a threaded elongated screw 30 with an enlarged finger manipulating knurled head 31 is projected through the end of the drive link member 28 in threaded engagement therewith to determine at which point the pin 29 will make engagement therewith and start moving the head rest 13 in a clockwise or elevated position as shown in FIGURE 1. A lock nut 32 is provided on the threaded screw 30 to prevent accidental rotation of the screw 30 relative to the tubular threaded end of the drive link member 28.

Similarly, the knee rest 15 is pivotally actuated through a lever or set of levers 33 pivoted as at 34 to the side rails of the knee rest section 15' while their other ends are pivoted as at 35 to arms 36 anchored to a stud 37 which is journaled between the side members 21 of the bed frame 10 in parallel spaced relation to the stud 25. Crank arms 38 are fixed to the stud 37 to pivot the arms 36 and impart movement to the levers 33 to raise or lower the knee section 15' so that the section 15' will move correspondingly up or down through the pivot 16 that connects them together. Similarly to the crank arms 26 described above, the bifurcated crank arms 38 have a pin 39 that extends through an elongated slot provided through the confronting walls of a tubular drive link member 41 that serves as the actuator for the knee rest section 15' as will presently appear from the description of mechanism to follow. Like the drive link tubular member 28, the drive link member 41 has an elongated threaded stud 42 with an enlarged finger manipulating knob 43 in threaded engagement with the tube end 44 to vary the position of engagement of the crank arm pin 39 therewith so that the knee rest 15 can be raised or lowered after or simultaneously with the head rest 13 depending upon the positioning of the threaded studs 30-42 and the desires of the user of the bed. Once the desired relationship between the movement of both the head rest 13 and knee rest 15 is established, the mechanism to be described will follow this relative movement of the spring sections 13-15 responsive to a single push button control of a reversible electric motor to be hereinafter described. A lock nut 45 is provided on the threaded stud 42 to abut against the tube end 44 to avoid any accidental or self-adjustment of the stud 42 which would vary the relative timing of the spring sections 13 and 15 either simultaneously, one after the other, or one without the other depending upon the effective length of the free sliding movement of the pins 27 and 39 in the slots 29 and 40, respectively.

As shown, the tubular link driven members 28-41 telescope within somewhat larger tubes 46-47 which terminate in solid bearing ends 48-49 having power screws 50-51 journaled therein through reduced stud ends 52-53 having cross pins 54-55 extending therethrough to es-

tablish a driving connection therebetween. The inner extremities of the inner telescoping tubes 28-41 are provided with free-wheeling drive journal assemblies 56-57 which ride on the screws 50-51 to lengthen or shorten the telescopic tube members 28-46 and 41-47 depending upon the direction of rotation of the drive screws 50-51. The free-wheeling drive journal assemblies 56-57 are of well known and standard construction which have sleeves 58-59 as a part thereof to engage pins 60-61 and 62-63 on the ends of the screw members 50-51, respectively, for permitting the continued rotation or idling of the drive screws 50-51 at the end of their extreme movement of rotation and displacement therealong without effecting any further travel of the otherwise moveable and responsive sleeves 58-59. This is rendered possible by providing cam teeth on the opposite peripheral edges of the sleeves 58-59 which engage the pins 60-61 and 62-63 that extend diametrically through the ends of the elongated screw members 50-51 to ride over the cam teeth without engagement with the pins 60-61 as the sleeves 58-59 arrive at the extremities of the screw members 50-51 irrespective of the continued rotation thereof without any further displacement therealong. Thus, the operator cannot endanger the instrumentalities by negligently depressing the electric motor control switch for extended periods beyond that necessary to displace the head rest 13 and the knee rest 15 to either of their extreme positions of maximum adjustment.

The bearings 48-49 are connected through stud shafts 64-65 to a train of spur gears 66-67 attached thereto for meshing engagement with an intermediate spur gear 68 fixed to an armature shaft 69 of a speed reducer 70. The gears 66-67-68 are confined in a housing 71 wherein the stud and speed reducer shafts 64-65-69 are journaled to rotatively support the spur gears 66-67-68, respectively. It should be noted that a universal joint 71' is operatively interposed between the end bearing 49 and the stud shaft 65 so that the telescopic drive tubes 41-47 may be disposed at an angle to the stud shaft 65 and the speed reducer driven shaft 69. The speed reducer 70 is built-in to the electric motor 72 which is of the reversible type and has a mounting stud 73 which extends completely therethrough for engagement with upstanding flanges 74-75 comprising part of mounting bracket supports 76-77. The bracket support 76 extends between the parallel cross-members 78-79 fixed between the side members 21 of the bed frame 10 while the support bracket 77 is directly attached thereto (FIGURE 3) to maintain the reversible electric motor 72 in a stationary fixed position on the frame 10 without any relative movement therebetween.

As shown, an electric cord 80 with conventional plug 81 (FIGURE 1) provides a portable power source to the electric motor 72 while a reversible control switch 82 has an electric cord 83 in circuit with the power cord 80 and the reversible fields of the electric motor 72 in accordance with standard practice so that the attendant or the patient or the individual in bed, may easily and simply control the operation of the electric motor 72 in one direction or another which, in turn, operate the head and knee rests 13 and 15 in any desired and pre-adjusted sequence through the linkage positioning adjusting studs 30-42 or the head rest 13 or knee rest 15 may be alone operable. Either head rest 13 or knee rest 15 can be rendered inoperative by turning either adjusting screw 30 or 42 outwardly so that the crank arm pins 27 or 39 ride the full length of the slots 29 or 40 respectively, thereby imparting no motion to the respective drive link members 28 or 41. By limiting the effective length of the slots 29 and/or 40 for variable extents through the adjusting studs 30-31 and 42-43, the head rest 13 will first elevate a desired distance whereupon the knee rest sections 15'-15'' will start to elevate; this being a matter of pre-selection by the doctor, the attending nurse, the

attending orderly, or the bed-ridden patient or individual desiring variations in rest positions.

Once the pre-selection and adjustment is made within a matter of minutes or even less, the operation sequence remains constant and the control 82 becomes the sole operating medium of the bed spring sections 13 and 15'-15". Another occupant of the bed spring 12 can request or personally make a readjustment within a matter of seconds or minutes, and the desired effect can again be reproduced or changed at will. The important thing is that this mechanism is capable of wide variation, but once adjusted there is but a single control without any transmission shifting, plural controls, plural motors, or confusing variations to the bed occupant. As shown, the single switch control 82 may be provided with an apertured ear 84 for suspending the reversible switch 82 from a simple hook 85 anchored to the bed frame bracket 11 within easy reach of the bed occupant or an attendant, and since the attendant or bed occupant has no other manipulation to perform, the mechanism is not subject to any abuse nor appreciable wear nor maintenance problems while admitting of simplicity in construction and thus making it possible to provide a comparatively inexpensive structure. It should be noted that the speed reducer 70 and the gear train 66-67-68 will serve as bed section locking or braking means.

While I have illustrated and described a preferred embodiment of the invention, it must be understood that my invention is capable of considerable variation and modification without departing from the spirit of the invention. I, therefore, do not wish to be limited to the precise details of construction set forth, but desire to avail myself of such variations and modifications as come within the scope of the appended claims.

I claim:

1. A power drive for hospital beds and the like having various sections for adjustable movement and locking upon command control comprising operating instrumentalities for each of said bed sections, a motor to electrically propel said operating instrumentalities, crank arms between said operating instrumentalities and said motor, means to vary the relationship between said operating instrumentalities and said motor so that the various bed sections may be pre-selectively timed for movement relative to each other and said bed.

2. A power drive defined in claim 1 wherein the means for varying the relationship between the operating instrumentalities and said motor are confined to at least one bed section.

3. A power drive for beds defined in claim 1 wherein the means for varying the relationship between the crank arms and the operating instrumentalities can be rendered inoperative to elevate one or more bed sections.

4. A power drive defined in claim 1 wherein the propelling means between the motor and the crank arms comprise a speed reducer and a train of spur gears to serve as bed section locking means when said operating instrumentalities are inactive to raise or lower said bed sections.

5. A power drive for bed spring frames having a head rest pivotal section and a knee rest pivotal section for adjustable elevation and descent, rotary screw drives for each of said bed spring frame sections, crank arms pivotally associated with said bed spring frame sections and said rotary screw drives to elevate and lower said bed spring frame sections responsive to the rotation of said rotary screw drives, a reversible electric motor, a gear train interposed between said motor and said rotary screw drives, and adjustable means associated with at least one of said rotary screw drives to vary the relationship of said crank arm associated therewith to change the timing operation of said head rest and knee rest frame sections relative to each other.

6. A power drive defined in claim 5 including a remote

control switch for said reversible electric motor to actuate said head rest and knee rest sections through said rotary screw drives.

7. A power drive defined in claim 6 wherein said adjustable means associated with at least one of the rotary screw drives consists of the means to change the moment arm between said rotary screw drive and said crank arm operatively associated therewith.

8. A power drive defined in claim 7 wherein the moment arm changing means consist of a slidable adjustable pivot between said crank arm and said rotary screw drive.

9. A power drive defined in claim 5 wherein said rotary screw drives consist of telescopic tube members with a rotary screw in each for direct connection to a gear comprising part of said gear train.

10. A power drive defined in claim 9 wherein said adjustable means to vary the relationship between a crank arm and a rotary screw drive consists of a slidable pivotal connection therebetween.

11. A power drive defined in claim 10 wherein said adjustable means include a threaded stud against which the pivotal connection abuts to shift it along a slot in one of said telescopic tube members.

12. A power drive for beds having sectional head and knee rest pivotal spring frame sections, driving link members including telescopic rotary screws for each of said pivotal spring frame sections, crank arms operatively connected to said bed spring frame section driving link members, levers between said bed spring frame sections and said crank arms for elevating and lowering said spring frame sections responsive to the operation of said telescopic rotary screw driving link members, and an electric motor with a speed reducer and gear of trains to operate said telescopic rotary screw driving link members to elevate and lower said bed spring sections in a predetermined sequence of movement.

13. A pair drive defined in claim 12 wherein at least one of said telescopic rotary screw driving link members and its pivotally connected crank arm has a pin connection slidable in a slot provided in the outer telescopic driving link member.

14. A power drive defined in claim 13 wherein adjustable means are provided to vary the effective length of the slot in the outer telescopic driving link member to vary the timing of movement between said bed spring frame sections.

15. A power drive defined in claim 14 wherein said adjustable means includes an elongated screw member threadedly engaging the end of the tubular outer telescopic driving link member to limit the slidable limit of said pin connection therein.

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