July 13, 1965 O. RICKENBACH 3,194,232

SPINAL EXTENSION TABLE

Filed July 5, 1961 4 Sheets-Sheet 1

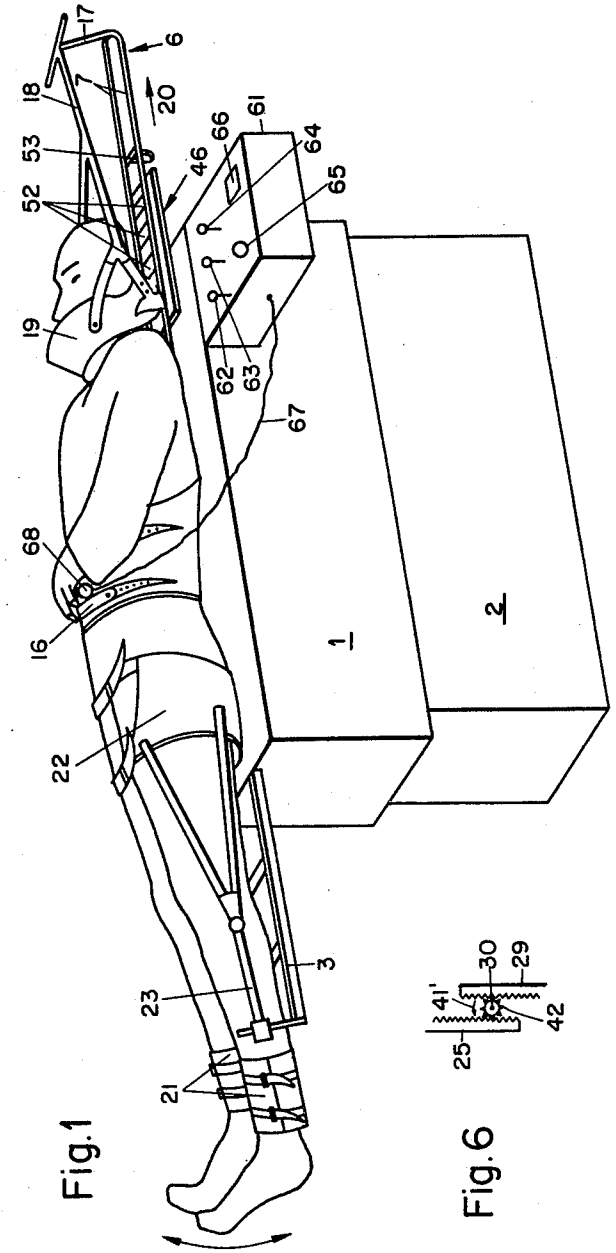

Fig.1

Fig.6

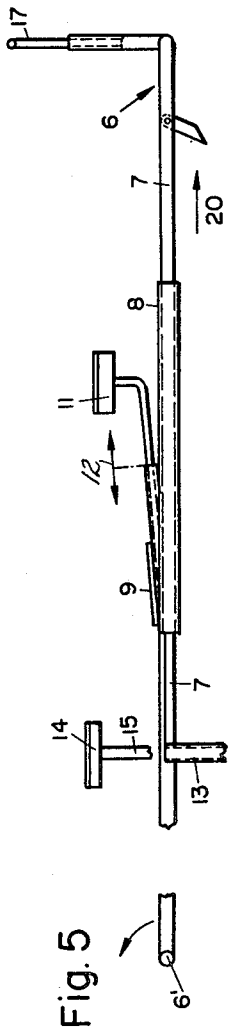

Fig.5

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SPINAL EXTENSION TABLE

Filed July 5, 1961 4 Sheets-Sheet 2

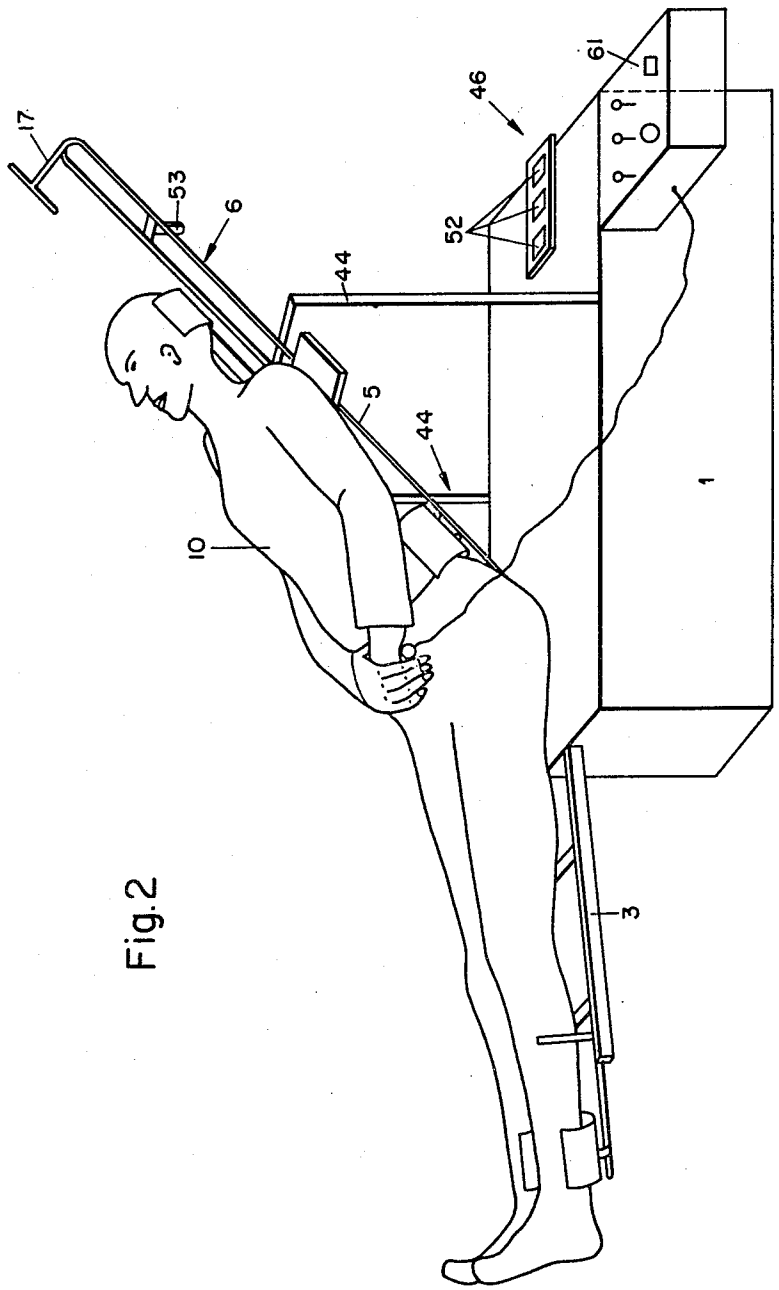

Fig.2

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SPINAL EXTENSION TABLE

Filed July 5, 1961 4 Sheets-Sheet 3

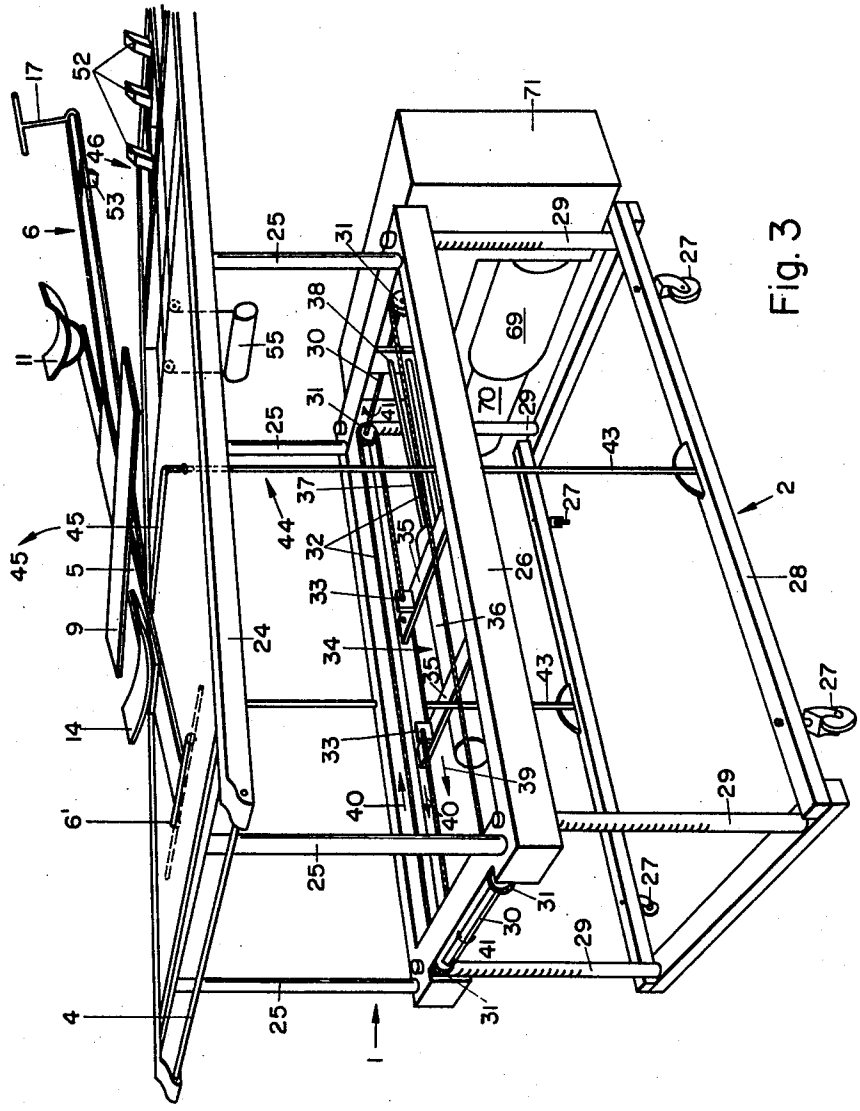

Fig. 3

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SPINAL EXTENSION TABLE

Filed July 5, 1961 4 Sheets-Sheet 4

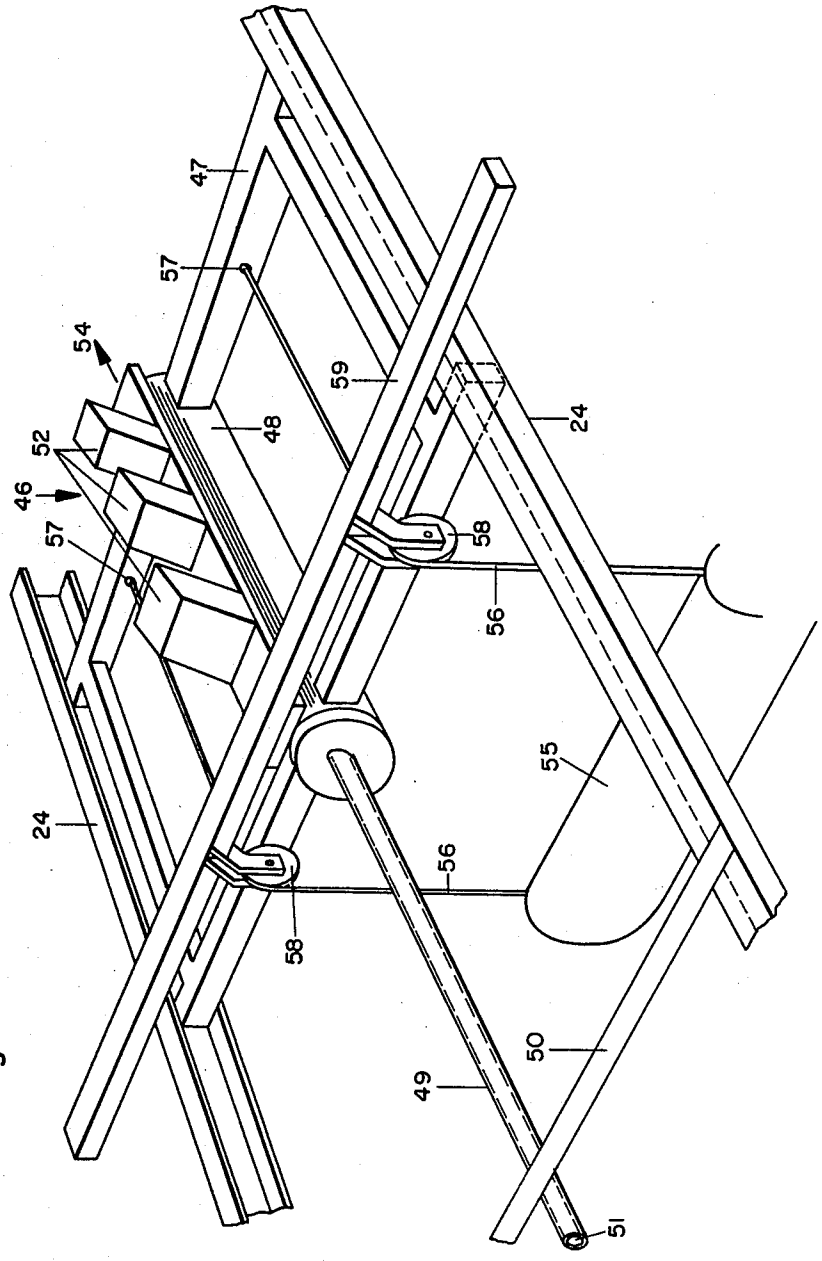

Fig. 4

United States Patent Office 3,194,232 Patented July 13, 1965

3,194,232

SPINAL EXTENSION TABLE

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Claims priority, application Switzerland, July 6, 1960, 7,688/60
9 Claims. (Cl. 128—71)

This invention relates to a table for extending a patient's spine, its main purpose being to facilitate mounting and dismounting which a patient often finds very difficult with known tables of this kind.

A table according to the invention includes an upper structure adjustable for height relative to a lower structure, a device for tilting the patient's trunk (hereinafter referred to as a "trunk tilter") pivotable about an axle mounted on the upper structure, and at least one support member attached to the lower structure which automatically causes the trunk tilter to pivot about the said axle when the upper structure is lowered from the working position of the table so that the trunk of a patient resting on the trunk tilter is raised into an inclined position.

A table according to the invention will now be described, by way of example, with reference to the accompanying diagrammatic drawings, in which:

FIG. 1 is a considerably simplified perspective view of the table in its working position, showing a patient reclining thereon;

FIG. 2 is a view corresponding to FIG. 1, showing the table in a lowered position;

FIG. 3 is a perspective view of some of the main components of the table;

FIG. 4 is a perspective view of a traction frame;

FIG. 5 is a side view of a trunk tilter and of a traction stirrup; and

FIG. 6 shows a pinion cooperating with two racks.

The table shown has an upper structure 1 which can be raised and lowered relative to a lower structure. The table is provided with a leg tilter 3, pivotable about an axle 4 (see FIG. 3), and also with a trunk tilter 5, pivotable about an axle 6' (see FIG. 3). The axles 4 and 6 are journalled in the upper structure 1 horizontally and parallel to each other. A traction stirrup 6 is slidably attached to the trunk tilter 5, its parallel limbs 7 being slidable in two tubes 8 which are attached to the sides of the trunk tilter 5 (see FIG. 5). The trunk tilter 5 is provided with a transverse part 9 on which the patient's shoulders come to rest. A head rest 11 is longitudinally slidable relative to the trunk tilter 5, as indicated by the double-headed arrow 12.

Two vertical tubular pieces 13 are attached to the free ends of the limbs 7 of the traction stirrup into which two vertical rods 15 attached to a trunk support 14 may be inserted. The patient 10 is strapped to the trunk support 14 by means of a trunk strap 16. A T-piece 17 is vertically adjustable and attached e.g. screwed to the yoke-end of the traction stirrup 6; to this T-piece a head strap 19 (a so-called neck-tie) may be attached by means of a traction member 18. It will be seen that either the head or the trunk of the patient can be drawn back, when the traction stirrup 6 is moved in the direction of the arrow 20 in a manner to be described later, depending on whether the neck-tie 19 or the trunk strap 16 is attached to the patient. Since the patient's legs are attached to the leg tilter 3 by means of leg straps 21 and his seat by means of a seat strap 22 and traction members 23, traction may be applied to the neck vertebrae or to the lower part of the spine.

As shown in FIG. 3, the upper structure 1 is provided with an upper frame 24 which is supported by four pillars

25 which take the form of racks which are slidable in an intermediate frame 26 which is arranged between the upper structure 1 and the lower structure 2 and slidable relative to both structures. The lower structure 2 is provided with a lower frame 28, supported by castors 27, the lower frame 28 being provided with four pillars 29 in the form of racks which are also slidable in the intermediate frame 26. Two parallel shafts 30, each of which has two chain sprockets 31 mounted on it, are journalled on the intermediate frame 26. Each pair of sprockets 31 is connected by a chain 32 whose ends are attached at 33 to a slide 34 longitudinally slidable in the frame 26. In FIG. 3 the ends of the front chain 32 are obscured by the frame 26. The slide 34 consists of two transverse members 35 which are welded to a longitudinally disposed cylinder 36.

The piston rod 37 of a piston slidable in the cylinder 36 is rigidly connected at 38 with the frame 26. By supplying the cylinder with a pressure fluid, the slide 34 can be moved in the direction of the arrow 39 relative to the frame 26, so that the chains 32 move in the direction of the arrows 40 and the shaft 30 turns in the direction of the arrows 41. In FIG. 3 the slide 34 is assumed to be nearly at the end of its stroke in the direction of the arrow 39.

Pinions 42 are mounted at the ends of the shafts 30 (see FIG. 6), each of them engaging with a rack 25 and a rack 29. When the shafts 30 rotate in the direction of the arrows 41, the pinions 42 displace the racks 25 upwardly relative to the intermediate frame 26. At the same time, the pinions 42 run upwards along the racks 29, whereby the intermediate frame 26 is moved upwardly relative to the lower frame 28.

When the pressure fluid is discharged from the cylinder 36, the pinions 42 are displaced in a direction opposite to that of the arrow 41 (see arrow 41' in FIG. 6) under the influence of the weight of the upper structure 1 and the intermediate frame 26, so that the intermediate frame 26 descends on to the lower frame 28 and the upper frame 24 on to the intermediate frame 26.

The table then assumes the position shown in FIG. 2 which is used by patients for mounting or dismounting it.

The lower ends of the limbs 43 of a vertical U-shaped support yoke 44 are attached to the lower frame 28. A transverse member 45 of the support yoke 44, which connects the limbs 43 together at the top, is disposed approximately at the level of the upper frame 24 below the trunk tilter 5 in the working position of the table shown in FIG. 1. When the upper structure 1 is lowered in the manner described, the transverse member 45 prevents the trunk tilter 5 from following this movement as a unit. Instead the trunk tilter is constrained to pivot in the direction of the arrow 45 about its pivotal axis 6 into the position shown in FIG. 2. Conversely, the trunk tilter 5 is pivoted into the horizontal position when the upper structure 1 is raised out of the position shown in FIG. 2 in which the patient can comfortably mount the table. This is of very great advantage to the patient who can mount or dismount a table of the known kind only with very great effort and pain, or has to be lifted on to or from it.

A traction slide 46 is slidably mounted on the upper frame 24 for working the traction stirrup 6. As shown in FIG. 4, the traction slide 46 has a slide frame 47 which is guided in the upper frame 24 and rigidly connected to a cylinder 48. The piston rod 49 of a piston slidable in the cylinder 48 is rigidly connected with the upper frame 24 by means of a transverse member 50 and has a bore 51 for conducting the pressure fluid into the cylinder 48. The slide frame is further provided with three tangs 52 arranged one behind the other in a row, which can selec-

tively cooperate with a tang 53 (see FIGS. 1 to 3) rigidly attached to the traction stirrup 6.

By means of the pressure fluid, the traction slide 46 can be moved in the traction direction indicated by the arrow 54 relative to the upper frame 24. For returning the traction slide 46 to its quiescent position, a weight 55 is provided which is suspended from two cables 56 which are attached to the slide frame 47 and 57 and taken over pulleys 58; the latter are attached to a transverse member 59 of the upper frame 24.

It will be seen that in the position shown in FIG. 1 the traction slide 46 carries the traction stirrup 6 with it in the traction direction via one of the tangs 52 and the tang 53, whereby the extending traction is exerted on the neck or lumber vertebrae. It should be stressed that the tangs 52, 53 are automatically disengaged when the table is lowered, so that there is no danger of thereby exerting a traction on the patient's head.

The leg tilter 3 is arranged to pivot about its pivotal axle 4, namely upwards as well as downwards through 90° from its horizontal position, as indicated in FIG. 1 by the double arrow 60, by means of another hydraulically actuable mechanism which is known per se and therefore not illustrated. Traction can be applied to the lower portion of the spine in known manner by tilting the legs up and down.

A control desk 61 is arranged at the head end of the upper structure 1 and provided, inter alia, with three operating members 62 to 64, e.g. levers or buttons. The operating member 62 serves for controlling the cylinder 48 and the operating member 64 for controlling the cylinder of the mechanism for moving the leg tilter 3 (not shown). An indicating instrument 65 serves to indicate the adjustable tractive force of the traction slide 46 and a timer 66 to adjust the duration of application of the tractive force. Provision may also be made for applying the tractive force periodically, i.e. for causing it, for short intervals of time of adjustable duration, to reach a predetermined value and to return to zero in between, so that the traction slide 46 is periodically reciprocated in an adjustable manner. A cable 67 connects a manual switch 68, in the form of an elastic pear, with the control desk 61. The manual switch 68 enables the patient to switch off the current to an electrically operated valve in the pressure conduit leading to the cylinder 48 of the traction slide 46, so that the pressure fluid can escape from this cylinder 48. Thus the patient is able to switch off the tractive force before the end of the set treatment time, in the event of the treatment causing him excessive pain.

A pump 70, driven by an electric motor 69 and mounted on the lower structure 2 (see FIG. 3), brings the working fluid, preferably oil, for the operation of the hydraulic cylinders up to the required pressure. A reservoir 71 for the oil or the like is also mounted on the lower structure 2. Since the upper structure 1 is lowered by means of its own weight and that of the intermediate frame 26 and of the parts attached thereto, the upper structure can be lowered and the patient raised, at any time by discharging the thrust cylinder 36 (operating member 62), even in the event of failure of the electricity supply to the motor 69.

Since only a single thrust cylinder 36 is provided—as opposed to, say, four, viz. one acting on each pillar of the upper structure—the possibility of skewing or jamming of the upper structure through failure of one of the cylinders or conduits is avoided. The provision of an intermediate frame 26 which experiences half the total throw of the upper structure 1 in the manner described, has been proved to result in very reliable and rigid guiding of the upper structure 1.

It will be appreciated that obviously numerous variations of the table described are possible. Thus, for example, two vertical posts may be attached to the lower frame 28, instead of the U-shaped support yoke 44, which act at the top on the ends of a transverse member attached to the trunk tilter 5. Furthermore, the slides 34 and 46 are preferably supported in their guides on rollers or ball bearings which have not been shown.

What I claim as my invention and desire to secure by Letters Patent, is:

1. A table for extending a patient's spine, comprising a lower base structure, uprights on said base structure, an upper structure slidably mounted on the uprights on said base structure and mounted thereon for vertical sliding movement, traction mechanism on said upper structure, a shaft on one end of said upper structure, a frame extending along said upper structure having one end connected to said shaft and forming a trunk tilter frame pivoted to said shaft, and a support member of inverted U-shaped construction with the limbs thereof attached to the lower structure, the transverse member of said structure connecting the limbs at the top being in engagement with the trunk tilter frame and disposed at the level of said upper structure below said trunk tilter frame when the table is in its working position, traction mechanism on said upper structure, and adjusting mechanism for moving said upper structure on said uprights.

2. A table for extending a person's spine, comprising a lower base structure, four pillars extending upwardly from said base structure, an upper frame structure movably mounted on said pillars, an intermediate frame arranged between the lower base structure and said upper frame, said pillars being in the form of racks and guided in said intermediate frame, said upper frame structure comprising four additional pillars in the form of racks and guided in said intermediate frame, four drivable pinions journaled in said intermediate frame, said pinions being in driving engagement with the racks of the base structure and the racks of the upper frame structure, so that the upper frame will be raised and lowered relative to the base structure when said pinions are rotated, during raising and lowering the intermediate frame will experience half the throw of the upper frame relative to the lower base structure, traction mechanism on said upper frame structure, and driving mechanism for said pinions.

3. A table for extending a person's spine, comprising a lower base structure, four pillars extending upwardly from said lower base structure, an upper frame structure movably mounted on said pillars, an intermediate frame arranged between the lower base structure and said upper frame, said pillars being in the form of racks and guided in said intermediate frame, four additional pillars on said upper frame structure in the form of racks extending downwardly therefrom and guided in said intermediate frame, four drivable pinions journaled in said intermediate frame, said pinions being in driving engagement with the racks in the lower base and the racks on said upper frame structure, so that the upper frame will be raised and lowered relative to the base structure when said pinions are rotated, driving mechanism for said pinions, the intermediate frame being arranged to experience half the throw of the upper frame structure relative to the lower base structure, a hydraulic thrust cylinder mounted on said intermediate frame drivingly connected to the driving mechanism of said pinions to move said intermediate and upper frames during their vertical adjustment, and body traction mechanism on said upper frame structure for exerting an extension force on a patient's spine.

4. A table for extending a patient's spine, comprising a base structure, rack bars extending upwardly from the corners of said base structure, an upper frame structure, four downwardly extending rack bars on said upper frame structure, an intermediate frame structure receiving the rack bars of the base and upper structures, pinions mounted on said intermediate frame structure drivingly engaging the corresponding rack bars of the base and upper structure, a body supporting frame forming a trunk tilter frame pivoted on the upper frame structure, a support member attached to the lower base structure and extending to the upper frame structure engageable

with the body support frame to cause the trunk tilter to pivot about the pivot axis when the upper frame structure is lowered from its working position so that the trunk of the patient resting on said trunk tilter frame will be raised into an inclined position, a slide slidably mounted in the intermediate frame, a thrust cylinder mounted on said slide, pinion gears mounted between the rack bars on the base member and upper frame, shafts on said trunk tilter frame for supporting said pinions, a sprocket gear on each of said shafts and sprocket chains engaging said sprocket gears with one of their ends attached to said slide with the ends thereof trained over said sprockets so that movement of said slide will rotate said pinions in unison adjusting mechanism for said pinions to adjust said upper frame structure relative to said lower base structure, and body traction mechanism on said trunk tilter frame and upper frame structure.

5. A table for extending a patient's spine, comprising a lower base structure, having vertical supports an upper frame structure movably and slidably mounted on the vertical supports, said base structure for vertical adjustment relative to said base structure, adjusting mechanism for moving said upper frame structure, a shaft extending transversely of said upper frame structure adjacent one end thereof, a body support frame on the upper frame structure pivoted to said shaft and forming a trunk tilter, at least one support member attached to the lower base structure and extending to the upper frame structure in engagement with the body support frame for automatically causing the body support frame to pivot on said shaft when the upper frame structure is lowered from the working position of the table so that the trunk of the patient resting on said body support frame will be raised into an inclined position, a traction stirrup slidably guided on the body support trunk tilter frame, a trunk support thereon to support the patient, straps attached to said last-named support for strapping the patient thereto, a head strap on said trunk tilter frame, traction members therefore, an attachment member for connecting said traction members to said traction stirrup, a tang on said traction stirrup extending downwardly therefrom, a traction slide mounted in said upper frame structure for longitudinal sliding movement, a tang on said traction slide for engaging the tang on said attachment member when the table is in its operative position, and mechanism for applying traction force to said traction slide.

6. A table for extending a patient's spine, comprising a lower base structure, upright supports on said base structure, an upper frame structure movably and slidably mounted on the uprights of said base structure for vertical adjustment relative to said base structure, adjusting mechanism for moving said upper frame structure, a shaft extending transversely of said upper frame structure adjacent one end thereof, a frame on the upper frame structure pivoted to said shaft and forming a body trunk tilter, at least one support member attached to the lower base structure and extending to and engaging the pivoted frame on the upper frame structure for automatically causing the trunk tilter pivoted frame to pivot on said shaft when the upper frame structure is lowered from the working position of the table so that the trunk of the patient resting on said pivoted trunk tilter frame will be raised into an inclined position, a traction stirrup slidably guided on the pivoted trunk tilter frame, a trunk support thereon, body encircling straps attached to said trunk support for strapping the patient thereto, a head strap on said pivoted trunk tilter frame, traction members therefor, a tang on said attachment member extending downwardly therefrom, a traction slide mounted in said upper frame structure for longitudinal sliding movement, a plurality of tangs on said traction slide, arranged such that the tang on the traction stirrup can be selectively engaged with one of the tangs on the traction slide, and mechanism for applying traction force to said traction slide.

7. A table for extending a patient's spine, comprising a base structure, rack bars extending upwardly from the corners of said base structure, an upper frame structure vertically movable on said base structure, downwardly extending rack bars on said upper frame structure, an intermediate frame structure receiving the corresponding rack bars of the base and upper structures in spaced relation, pinions mounted on said intermediate frame structure in the spaces between said rack bars for drivingly engaging the same, a body supporting frame forming a trunk tilter pivoted on the upper frame structure, a support member attached to the base structure and extending upwardly into engagement with the frame of the trunk tilter to pivot the same about its pivot axis so that when the upper frame structure is lowered from its working position the trunk of the patient resting on said trunk tilter frame will be raised into an inclined position, a slide slidably mounted in the intermediate frame, a thrust cylinder mounted on said slide, pinion gears supporting shafts journaled in said intermediate frame, sprocket gears on each of said shafts, sprocket chains trained over opposed sets of sprocket gears and having their free ends attached to said slide so that movement of said slide will rotate said sprocket gears and pinions in unison, a traction slide, a second thrust cylinder arranged on said upper frame structure drivingly connected to said traction slide to move the same in the direction of traction, and adjusting mechanism for said pinions and traction slide.

8. A table for extending a patient's spine, comprising a base structure, rack bars extending upwardly from the corners of said base structure, an upper frame structure, four downwardly extending rack bars on said upper frame structure, an intermediate frame structure receiving the rack bars of the base and upper structures, pinions mounted on said intermediate frame structure drivingly engaging the corresponding rack bars of the base and upper structure, a body support frame forming a trunk tilter pivoted on the upper frame structure, a support member attached to the base structure and extending upwardly to the upper structure in engagement with the body support frame to cause the trunk tilter to pivot about said pivot axis when the upper frame structure is lowered from its working position so that the trunk of the patient resting on said trunk tilter frame will be raised into an inclined position, a slide slidably mounted in the intermediate frame, a thrust cylinder mounted on said slide, shafts for supporting said pinions, a sprocket gear on each of said shafts, sprocket chains trained over said sprocket gears with their ends attached to said slide so that movement of said slide will rotate the pinions in unison, mechanism for actuating said slide, a manual switch for said mechanism operatively connected to said thrust cylinder to enable the patient to render the same inoperative, and body traction mechanism on said body support frame and upper frame structure.

9. A table for extending a person's spine, comprising a lower base structure, supports on said structure, an upper frame structure movably mounted on the supports of said base structure and adjustable for vertical movement relative thereto, an intermediate frame structure arranged between the lower base structure and upper frame structure, said supports being in the form of racks guided in said intermediate frame, four additional supports on said upper frame structure in the form of racks also guided in said intermediate frame in overlapping relation from said first named supports, four drivable pinions journaled in said intermediate frame between said overlapping supports and arranged in driving engagement with the racks thereof, actuating mechanism for said pinions, whereby the upper frame structure will be raised and lowered relative to the base structure when said pinions are rotated, a body supporting frame pivoted to said upper frame structure forming a trunk tilter, a support member attached to the lower base structure and extending to the upper frame

structure in engagement with the body supporting frame to cause the same to pivot on said upper frame structure when the same is lowered from the working position of the table so that the trunk of the patient resting on said body supporting frame and trunk tilter will be raised into an inclined position, a leg tilter frame hingedly attached to the upper frame structure and pivotally mounted thereon for up and down movement when the table is in its working position, and traction mechanism on said trunk tilter frame and upper frame structure adapted to be connected to the body to extend the spine.

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