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2,828,172

MEDICAL EXAMINATION, OPERATING AND X-RAY TABLE

Filed Dec. 26, 1956

3 Sheets-Sheet 1

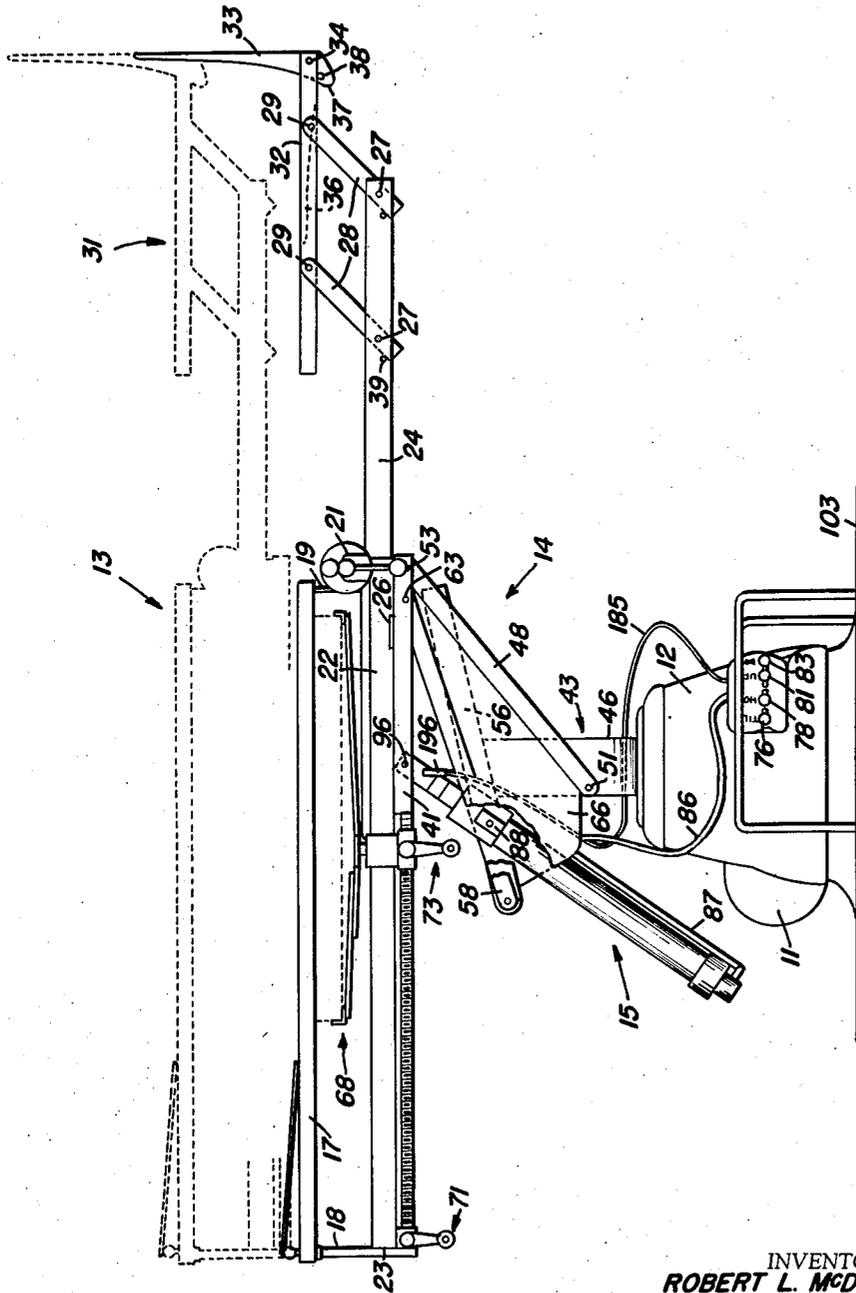


FIG. 1.

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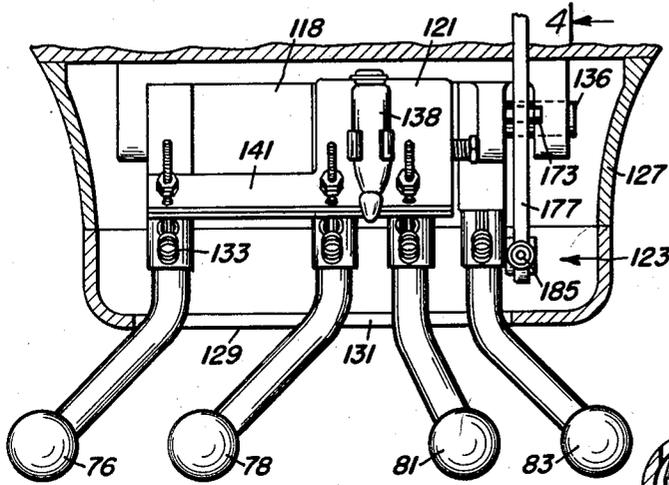


FIG. 3.

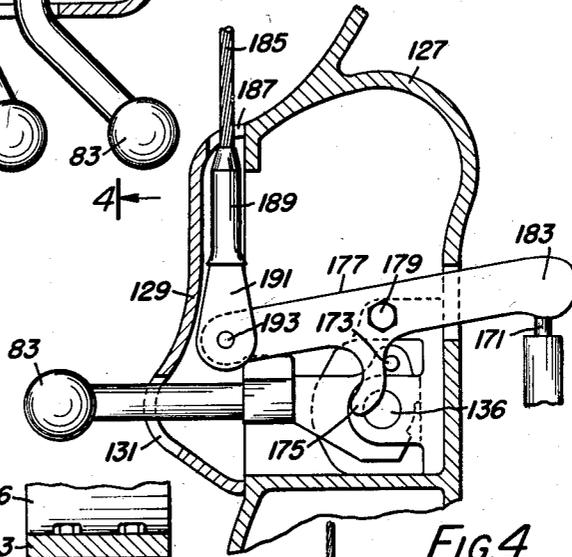


FIG. 4.

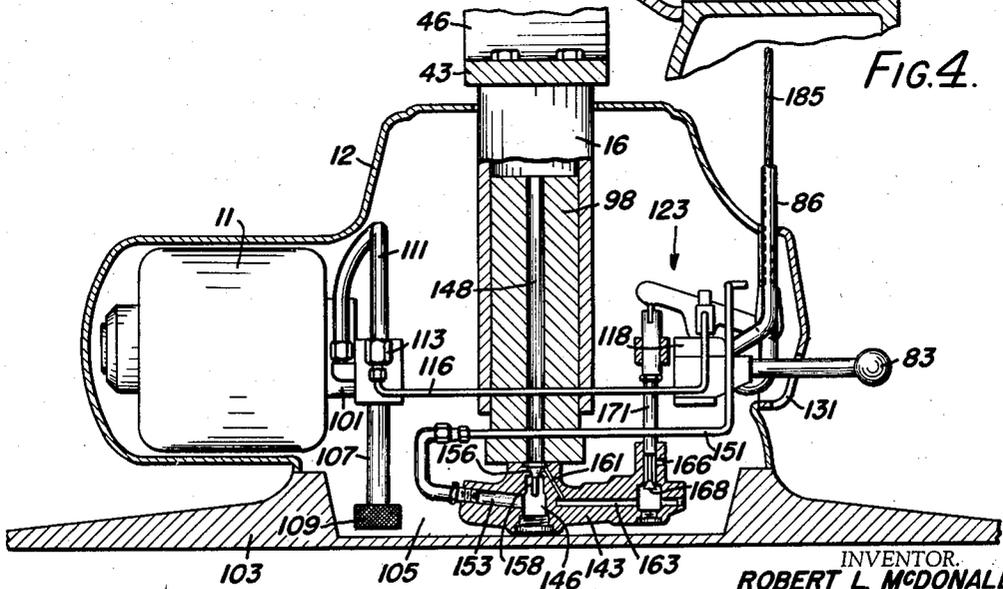


FIG. 5.

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2,828,172

MEDICAL EXAMINATION, OPERATING, AND
X-RAY TABLE

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Application December 26, 1956; Serial No. 630,491

11 Claims. (Cl. 311—6)

My invention relates to medical examination, operating and X-ray tables and more particularly to that type of table employed for the most part by urologists.

An object of my invention is to provide an examination, operating and X-ray table which is hydraulically controlled to either raise and lower the table or tilt the table longitudinally about a horizontal transverse axis to the end that maximum convenience of the urologist is secured in shifting the patient into various positions for radiography, pyelography and urological examination while maintaining utmost support and comfort for the patient.

Another object of my invention is to provide a hydraulically controlled and operating table wherein the table may be shifted from a horizontal position in which position various diagnostic examinations may be performed on a patient supported on the table; to a position approaching the vertical, the approved position for securing pyeloureterograms, without the necessity of the urologist first raising the table to an elevated position before it can be tilted to raise the patient to the essentially upright position.

Still another object of my invention is to provide a table, particularly for use by urologists, in which a mechanical set of linkages raise the table at the same time that it is hydraulically tilted from the horizontal to an essentially vertical position whereby when the table is in the horizontal position it is sufficiently low to enable the urologist to perform his work with maximum comfort while seated and when the table is shifted to the essentially vertical position the leg sections of the table do not strike the floor.

It is also an object of my invention to provide means which automatically causes operation of the hydraulic mechanism to cause a lowering of the table if it is being tilted to a position approaching the vertical from an elevated horizontal position. It has been found that when the table is at a raised elevation and is tilted to the essentially vertical position it becomes top-heavy and it is necessary to lower the table to thereby lower the center of gravity thereof.

A further object of my invention is to provide such automatically operable means for lowering the table a certain amount under certain conditions when the table is being tilted which means is not operable when the table is tilted from a position which is not sufficiently elevated to cause the table to be top-heavy. The highly advantageous features of such automatic operation will be recognized when it is fully realized that this relieves the operator of the table of the responsibility of being certain that the table is at all times in such position that it will not be top-heavy when tilted.

Other objects and advantages of my invention will be particularly set forth in the claims and will be apparent from the following description, when taken in connection with the accompanying drawings, in which:

Fig. 1 is a side elevation of the medical examination

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and operating X-ray table of my invention showing the table in a horizontal position; and showing in dotted lines the table in an elevated position;

Fig. 2 is a view similar to Fig. 1 with the foot rest and leg support sections extended and with the table in an essentially vertical position, the dotted lines illustrating the elevated position of the table at which position it would be top-heavy;

Fig. 3 is horizontal view partly in section showing part of the foot pedal control housing and the foot pedals for controlling the hydraulic circuits;

Fig. 4 is a view taken on the line 4—4 of Fig. 3;

Fig. 5 is a vertical sectional view, somewhat diagrammatic, taken through the housing which encloses the motor, pump and part of the controls and hydraulic circuits for the examination and operating table of my invention.

The table of my invention, while of more general use, has been more particularly designed for use by urologists, as a combined examination, operating and X-ray table. The examination, operating and X-ray table of my invention comprises an electric motor 11, a housing 12 which encloses suitable hydraulic mechanism, a table assembly generally indicated by the numeral 13, together with a novel arrangement of linkage, generally indicated by the numeral 14, between the table assembly 13 and the piston hydraulic lift cylinder 16 of the hydraulic mechanism, the purpose of which will later appear.

The table 13 may be generally similar to that shown in my co-pending application Serial No. 383,518 filed October 1, 1953 and entitled, "Medical Examination, Operating and X-ray Table," and the table comprises a frame 17 which is essentially rectangular in section and U-shaped in plan. As described in the aforementioned patent application the table 13 may be formed with a flat sheet forming a table surface which is supported in the frame 17; and this table surface may be formed of any suitable material which is pervious to X-ray radiation such as Bakelite.

The transverse cross piece forming the head end of the frame 17 has secured to the under side thereof a U-shaped bracket 18 which extends beneath the table frame and constitutes part of a rigid frame for the support of the table surface framing above described.

The right hand end of the frame 17 (as viewed in Fig. 1) is supported by a transverse bar 19 which is attached to two fixtures 21, one on each side of the table. The fixtures 21 are mounted on and secured to two longitudinally extending bars 22 to which the U-shaped bracket 18 is also secured as shown at 23.

I provide a pair of short longitudinal bars 24 which are slidable on the bars 22 to position as illustrated in Fig. 1 of the drawings, extended beyond the ends of the bars 22 or to retracted position beneath the table. Any suitable slidable support for the bars 24 may be provided such as the arrangement illustrated and described in my aforementioned co-pending application Serial No. 383,518, and the forward ends of the bars 24 rest upon and slide with respect to a pair of lugs 26 secured to the under sides of the bars 22.

The slide bars 24 have pivoted thereto as shown at 27 parallel motion links 28 which are pivotally connected, as shown at 29 to a foot and leg rest assembly generally indicated by the numeral 31.

The foot and leg rest assembly 31 comprises a pair of side bars 32 constituting a frame across which sheet metal rests for the calves of the legs extend. The sheet metal leg rests are recessed below the top edges of the side bars 32 so that a foot rest 33 may be shifted around a pivot 34 to the dotted line position shown at 36. In this position the foot rest 33 lies wholly below the top edges

of the side bars 32. The foot rest is provided with angularly extending parts 37 having stop pins 38 to limit the foot rest 33 to the substantially right angle position with respect to the side bars 32 shown in Fig. 1. The parallel motion links are provided with stops 39 to limit the movement of the side bars 32 to the parallel relationship with respect to the slide bars 24.

It will now be apparent from a comparison of Figs. 1 and 2 that when the table is in the horizontal position shown in Fig. 1 the slide bars 24, together with the foot and leg rest assembly 31 are hidden beneath and substantially enclosed by the table 13 and its associated parts. However, as will presently appear, the table may be tilted as shown in Fig. 2 to substantially a vertical position. Prior to tilting the table the slide bars 24 are pulled outwardly and the parts of the foot and leg rest assembly 31 shifted to the positions disclosed in Figs. 1 and 2. In this position of the table the patient stands on the foot rest 33 with his back and shoulders resting or leaning against the table surface which is mounted on and between the frame 17. In the substantially vertical position of the table as illustrated in Fig. 2 of the drawings, it will be evident that if the table was raised too high (such as the position shown in dotted lines) it would be top-heavy which could cause injury to the patient and damage to the table. It is to avoid this possibility that I have designed the automatically operable means which causes a lowering of the table during the tilting operation provided the table is at too high an elevated position.

Secured to the underside of the longitudinal bars 22 are short longitudinal bars 41. These bars 41, together with the longitudinal bars 22, are fixed with respect to the table frame 17. The table tilting mechanism is connected to these short longitudinal bars 41.

A yoke 43 having upstanding arms 46 is rigidly secured to the plunger or piston 16 which operates within the housing 12 to raise and lower the table. Pivot bars or links 48 are pivoted at 51 to the outer sides of the arms 46 of the yoke 43. The upper ends of the pivot bars 48 are pivoted to the short longitudinal bars 41 at 53 adjacent the forward edge of the table.

Rigidly secured to the upper ends of the arms 46 of the yoke 43 are a pair of bars 56. These bars 56 extend angularly with respect to the arms 46 of the yoke 43 and slidably receive a drain in the manner as disclosed in detail in my aforementioned pending application Serial No. 383,518. A pair of pivot bars or links 58 are pivoted to the fixed bars 56 at 61 and pivoted to the short longitudinal bars 41 at 63.

Secured to the inner side edges of the pivot bars 58 are shields 66 which extend downward on the inside of the pivot links 48 and between these links and the rigid bars 56.

The table includes a Bucky assembly of the type and mounting illustrated in my pending application Serial No. 383,518, and I have designated this Bucky assembly in its entirety by the numeral 68. The shifting mechanism of the disclosed Bucky assembly may be the same as that shown in the aforementioned application Serial No. 383,518 and includes operating means designated generally by the numerals 71 and 73.

Enclosed within the housing 12 and driven by the electric motor 11 is an oil pump which through suitable controls supplies oil under pressure to the cylinder in which the piston 16 operates, and to a tilt cylinder generally indicated by the numeral 15. The hydraulic controls comprise a table tilting pedal 76, a horizontal table positioning pedal 78, a table raising or "up" pedal 81, and a table lowering or "down" pedal 83. Certain parts of the mechanism within the housing 12 and certain of the hydraulic controls, together with the mechanism operated thereby, may be similar to that shown in application Serial No. 331,771 filed January 19, 1953, now Patent No. 2,764,459.

A flexible connection 86 extending from the hydraulic

unit contains two flexible conduits which extend to a branch fitting (not shown) which provides conduits one of which, 87 connects with one end of the tilt cylinder 15 and the other (not shown) connects with the other end of the cylinder. The hydraulic connections to the tilt cylinder may be the same as in my co-pending application Serial No. 383,518.

The upper end of the tilt cylinder 15 is carried by a cross bar 88 which is pivoted with respect to the fixed bars 56. A piston rod 91 extends from the upper end of the cylinder and is rigidly connected to the piston (not shown) located within the hydraulic cylinder 15. A cross bar 93 is pivotally connected at 96 to the short longitudinal bars 41. The outer end of the piston rod 91 is enlarged and bifurcated to straddle the bar 93 as illustrated in my co-pending application Serial No. 383,518.

With the table in horizontal position as illustrated in Fig. 1 and it is desired to shift the table to the position illustrated in Fig. 2 for the purpose of making X-rays with the patient in substantially an erect posture to show the location of the kidneys or ureters, the urologist first extends the slide bars 24 to their outermost position and erects the foot and leg rest assembly 31. With the patient's feet resting on the foot rest 33 and his back and shoulders reclining on the table, the urologist depresses the tilt pedal 76 to supply oil under pressure to the connection 87 and permits discharge of oil from the upper end of the cylinder.

During the raising of the table the action of the various parts is substantially the same as in my co-pending application Serial No. 383,518. Thus, the pivot points 53 and 63 swing upward and the pivot points 63 move around the pivot points 53. This is evident from a comparison of Figs. 1 and 2. The raising action during the tilting of the table raises the foot and leg rest assembly 31 so that the table may be swung to the position shown in Fig. 2 without the foot and leg rest assembly striking the floor. Thus it is unnecessary when the table is in lowered position to raise the table prior to tilting it.

As I have mentioned above one of the major objects of my invention involves automatically operable means for lowering the center of gravity of the table during the tilting operation if the table is in too high an elevated position when the tilting operation is initiated.

The hydraulic system which is under the control of the operator of the table may be similar to that disclosed in my application Serial No. 331,771, now Patent No. 2,764,459, and for the most part is enclosed within the housing 12 and includes the hydraulic lift cylinder 16 which to a large extent has been diagrammatically illustrated. However, it will be understood that the lift cylinder 16 is connected to yoke 43 to raise and lower the yoke and thus raise and lower the entire table unit. The hydraulic lifting mechanism includes a stationary piston 98 and the movable cylinder 16.

The motor 11 drives a hydraulic pump 101 which may be of any suitable type, for example, a hydraulic positive displacement gear pump. The housing 12 is supported on a base 103 in which a sump or reservoir 105 is provided. A connection 107 extends into the sump and has a filter 109 mounted on the lower end thereof, the connection or pipe 107 conveying oil to the suction (not shown) of the pump 101 when the pump is operating to create a suction in the pipe.

The pump 101 discharges into a high pressure hose 111 which extends into a rigidly secured fitting 113 adapted to receiving tubing 116. The tubing 116 is adapted to carry oil under high pressure from the pump to a valve block 118 formed in a valve block casting 121. The valve block 118 constitutes a part of a switch assembly designated generally by the numeral 123 which functions to control the hydraulic systems for causing the operation of the table and the switch assembly including the hydraulic controls and their operation may be generally the same as disclosed in detail in my application

Serial No. 331,771, now Patent No. 2,764,459. As in my aforementioned Patent No. 2,764,459 the foot pedals 76 and 78 are operably connected to valve mechanism for controlling flow of fluid to the tilt cylinder 15 while foot pedals 81 and 83 are operably connected to valve mechanism for controlling flow of fluid to piston 16 for raising and lowering the table.

When it is desired to tilt the table from the position shown in Fig. 1 to that shown in Fig. 2 the foot pedal 76 is depressed and in order to return the table to horizontal position the pedal 78 is depressed, and to raise the table to the dotted line position of Fig. 1 the pedal 81 is depressed and to lower the table the pedal 83 is depressed. The actuation and operation of the fluid control valves upon operation of any of the pedals is disclosed in my Patent No. 2,764,459.

The foot pedals 76, 78, 81, and 83 extend into a control housing 127 provided with a cover plate 129. The cover plate is provided with an elongated opening or separate slots 131 in which the foot pedals may operate.

I provide springs 133 which are spacedly fixed at one end in any suitable manner to the top of the control housing to extend downwardly therefrom. I provide a spring for each foot pedal to which the other or lower end of the spring is fixed in any suitable manner. It will be understood that these springs restore the foot pedals to their normal position when foot pressure is released. Suitable bearings are provided in the valve block casting 121 for the reception of a shaft 136.

The inner end of the foot pedal 81 is pinned to the shaft while the inner end of foot pedal 83 is loose on the shaft 136.

As in my aforementioned Patent No. 2,764,459 I provide a mercury switch 138 which is mounted on a pivoted cradle 141. By the means shown in my Patent No. 2,764,459 the pedals 76, 78 and 81 are operatively connected to the cradle so that the mercury switch will be opened and closed by actuation of these three pedals.

The mercury switch 138 is in circuit with the motor 11 so that the mercury switch when tilted will cause the motor to start and hydraulic fluid under pressure will be supplied to one side or the other of the tilt cylinder 15 or to the hydraulic cylinder 16 dependent upon which of the three foot pedals 76, 78 or 81 is depressed. When the depressed foot pedal is released, the corresponding spring 133 restores the foot pedal to normal position, the mercury switch is shifted to open position and the motor is de-energized.

I provide a casting 143 having a passage 146 therein which connects with a passage 148 formed in a part integral with the stationary piston 98. I also provide a high pressure fluid line or tube 151 which connects with the switch assembly or valve block and carries fluid under pressure to a passage 153 which is in communication with passage 146. The casting 143 has a seat 156 upon which a check valve 158 seats. A passage 161 is provided in the casting 143 which connects to a point above check valve 158 and communicates with a passage 163 which connects with a port 166. A valve 168 actuated by a valve stem 171 opens and closes communication between the passage 163 and the port 166 for a purpose which will later appear.

Referring particularly to Fig. 4 of the drawings wherein I have illustrated the mounting and operating connections of the foot pedal 83 which is the pedal loosely mounted on shaft 136 and the pedal which controls the lowering of the table I have provided a pin 173 carried on a boss on the inner end of the foot pedal 83. The pin 173 engages a depending finger 175 of a rocking lever 177 which is pivoted at 179 on a part of the valve block casting so that upon movement of the pedal 83 the lever 177 will be caused to rock. One end of the lever 177 extends through a slot 131 in the casing to provide a projecting portion 183 which engages the upper end of the valve stem 171.

I provide a cable or like operating means 185 which extends through an aperture 187 in the casing and has its end fixed in a ferrule or the like 189 to which is fixed any suitable connecting element 191 which is pivotally connected as at 193 to the inner end of lever 177. The cable 185 extends upwardly from the casing and at its upper end is fixed to the upper end of the piston rod 91 as at 196. Consideration of Fig. 1 of the drawings illustrates that there is slack in the cable when the table is in a lowered position.

When the foot pedal 83 is depressed the pin 173 rocks the lever 177 about pivot 179 to depress the valve stem 171 and open valve 168. Opening valve 168 permits oil in the hydraulic cylinder 16 to escape through the port 161, passage 163 and port 166 back to the sump or reservoir 105. The release of pressure in the hydraulic cylinder permits the weight of the table to force the oil out of the hydraulic cylinder 16 to allow the table to descend.

As I have stated one of the important aspects of my invention resides in the provision of means to cause automatic lowering of the table if it is at too great an elevated position when it is being tilted to assume a substantially vertical position in order that when so tilted it will not be top-heavy. This automatic lowering operation is produced by the cable 185 and the apparatus which is operated thereby under certain predetermined conditions.

When the table is in its lowermost position as disclosed in full lines in Fig. 1, it will be evident that there is considerable slack in the cable 185. There is sufficient slack in such position of the table that it may be fully elevated to the dotted line horizontal position and while the cable will become somewhat lengthened, it will not pull and cause rocking of the lever 177. However, if the piston rod 91 is projected to tilt the table when the table is in a fully or almost fully raised horizontal position, the table as it is tilted on the linkage system will be lowered bodily. The upward or tilting movement of the table will pull the cable upwardly. Since the lower end of the cable is fixed to lever 177, it will be rocked and the valve 171 opened to release pressure in the cylinder 16 for a lowering of the table to a point lowering the center of gravity thereof and ensuring that, in substantially vertical position, the assembly will not be top-heavy.

It is to be understood that when the table is lowered sufficiently to eliminate its top heaviness the pull on the cable will be released and pedal 83 will return to normal position under action of its spring 133 whereupon valve 168 will be closed and the cylinder 16 and table will stop their descent. It is to be understood that while I have illustrated a cable for causing the automatic lowering of the table under certain conditions I may employ other suitable means.

It will now be understood that with the table in its lowermost position or partly elevated position, the cable release serves no function and the table will be tilted and raised bodily so that the foot rest will not strike the floor.

However, if the table when in a horizontal position is at any position of elevation such that if tilted, it will be top-heavy, then the cable will function to lower the piston 16 during the tilting operation.

While I have shown and described the preferred form of my invention, it will be apparent that various changes may be made, particularly in the form and relation of parts, without departing from the spirit of my invention as set forth in the appended claims.

I claim:

1. A medical examination unit comprising, in combination, a table, hydraulic means for raising and lowering the table and supporting the table in a horizontal position, means for tilting the table longitudinally when it is in a horizontal position and means interacting with said tilting means for modifying the tilting action to raise the table bodily as it is being tilted out of said horizontal position, and further means automatically causing a lower-

ing of the table when it is raised bodily in the tilting action to a predetermined elevated position.

2. A medical examination unit in accordance with claim 1 wherein said further means is inoperative when the table is lowered below said predetermined elevated position, whereby the descent of the table is stopped.

3. A medical examination unit comprising in combination, a table, hydraulic means for raising and lowering the table and supporting the table in a horizontal position, means for tilting the table longitudinally when it is in a horizontal position and further means automatically causing a lowering of the table when it is tilted and is raised to a predetermined elevated position.

4. A medical examination table comprising, in combination, a table, hydraulic means including controls therefor enabling the hydraulic raising and lowering of the table and the independent hydraulic tilting of the table about a horizontal transverse axis means for raising the table independently of said hydraulic table raising means when the tilt control is actuated to tilt the table and further means connected to said table and said table lowering control and operable to actuate said table lowering control to cause a lowering of the table when the table is raised upon actuation of said tilt control to a predetermined elevated position.

5. A medical examination table in accordance with claim 4, wherein said further means is inoperative when the table is lowered below said predetermined elevated position, whereby the descent of the table is stopped.

6. A medical examination table in accordance with claim 4, wherein said table lowering control is operator depressed for causing the lowering of the table and said further means is connected to said pedal for its depression thereby to automatically cause a lowering of the table.

7. A medical examination table in accordance with claim 4 wherein said further means is a flexible member.

8. A medical examination table in accordance with claim 4, wherein said further means is a cable of a length producing slack therein when the table is in a position below the predetermined elevation, and is taut and pulled upward when the table is at or above said predetermined elevation.

9. A medical examination table comprising, in combination, a table, hydraulic means including independent controls for the hydraulic raising and lowering of the table, and further controls for the independent hydraulic tilting of the table about a horizontal transverse axis, means for raising the table independently of said hydraulic table raising means when the tilt control is actuated to tilt the table, and said table lowering control including a pedal adapted to be depressed by the operator of the table, a rocking lever operatively connected to said pedal, a valve controlling the flow of fluid in said hydraulic means to permit lowering of the table when said valve is open and said valve being engaged and opened by said lever when it is rocked upon depressing said pedal to permit lowering of the table, a cable fixed at one end to said lever and at its other end to the table and operable when said table is raised upon actuation of said tilt control to a predetermined elevated position, to depress said pedal and to rock said lever to thereby open the valve.

10. A medical examination table in accordance with claim 9, wherein said cable is of a length producing slack therein when said table is below said predetermined elevated position and is taut and is exerting a rocking pull on said lever when the table is at or above said predetermined elevated position.

11. A medical examination in accordance with claim 9 wherein further means is provided for restoring said pedal and lever to normal position and closing the valve when the table is below the predetermined elevated position.

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