United States Patent

[11] 3,609,357

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[21] Appl. No. **820,089**
[22] Filed **Apr. 29, 1969**
[45] Patented **Sept. 28, 1971**
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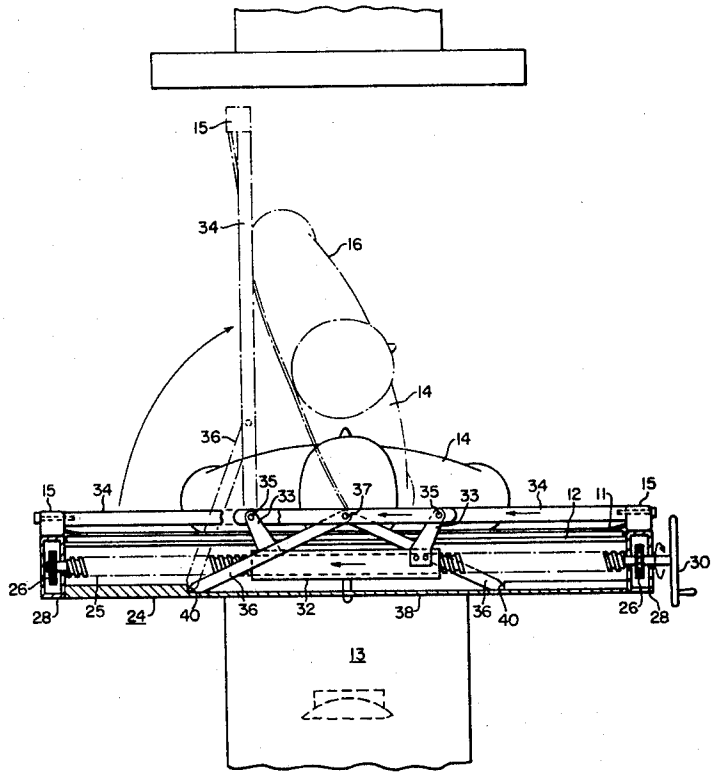
[54] **PATIENT-TILTING DEVICE FOR AN X-RAY TABLE**
7 Claims, 10 Drawing Figs.

[52] **U.S. Cl.** **250/55,** 5/61, 5/62
[51] **Int. Cl.** **G01n 23/00**
[50] **Field of Search** 250/54, 55, 56, 57, 58; 5/61, 62; 269/322, 323

[56] **References Cited**
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ABSTRACT: Described is an improved device for use atop such as an X-ray examination table to tilt the supine patient about an axis extending lengthwise of the table top. A thin, flexible, semistiff, X-ray-transparent, normally flat, sheetlike member accepts the supine patient thereon and overlies the table top for support. Elongated rigid lift rods attached to opposite side edges of the sheetlike member provide for vertical actuation thereof. Actuating mechanisms at opposite ends of the rods provides for selective degrees of raising of one lift rod while translating the other rod laterally inward along the table top. The sheetlike member and side rods are removable as a unit to act as a patient carrier if desired.



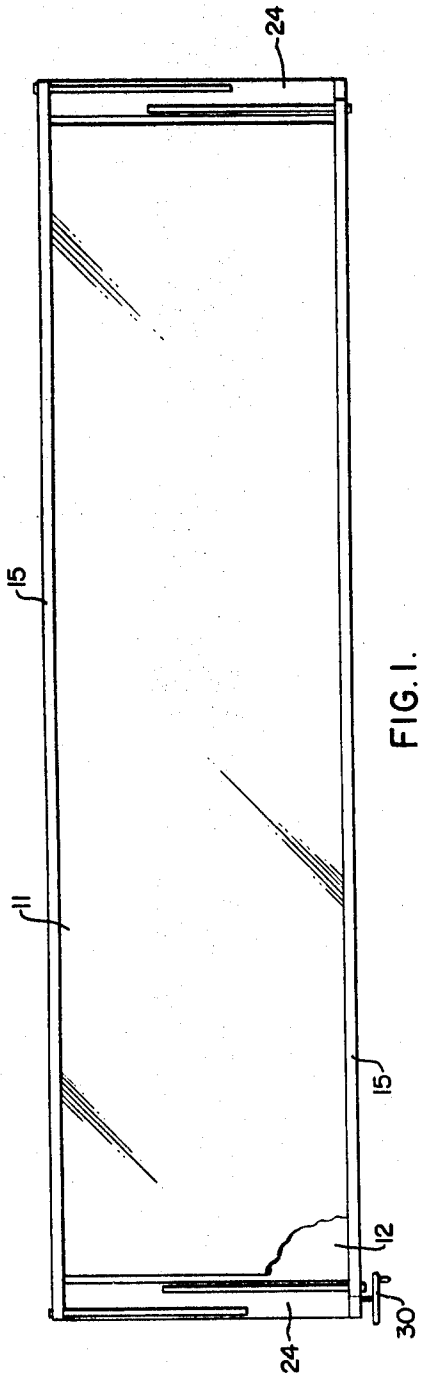


FIG. 1.

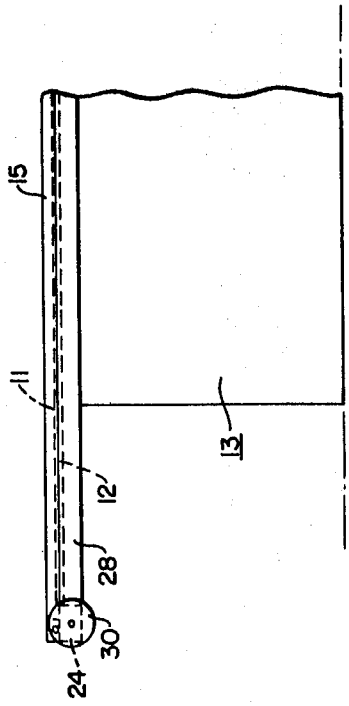


FIG. 3.

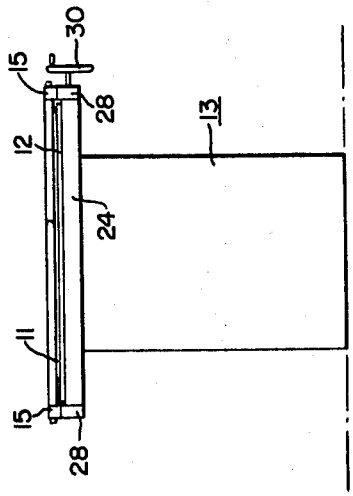


FIG. 2.

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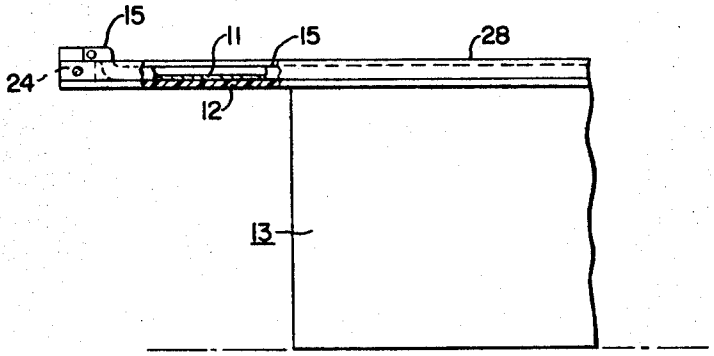


FIG. 4.

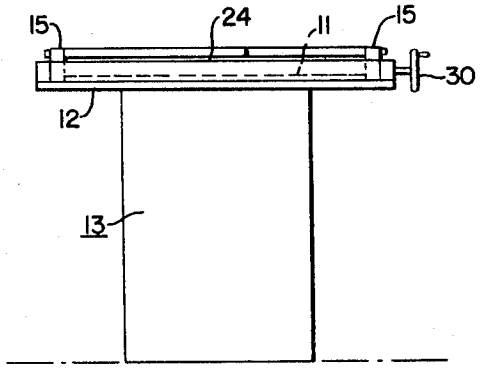
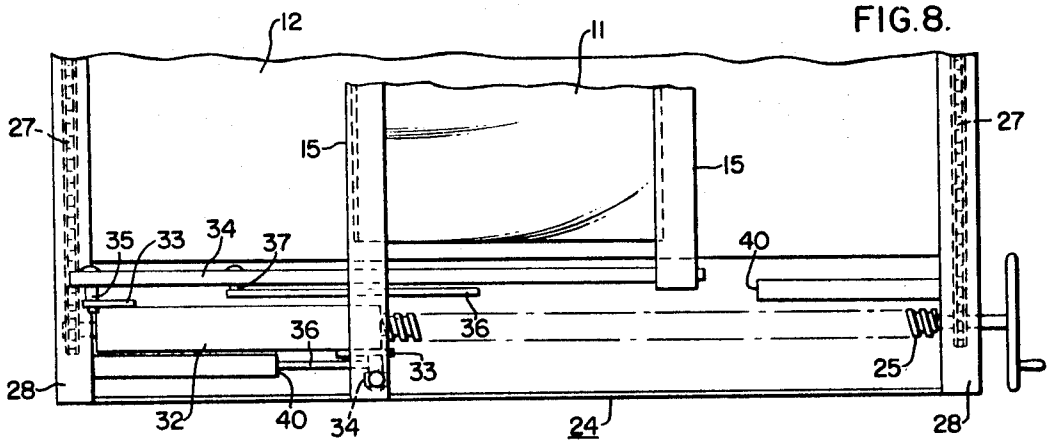


FIG. 5.

FIG. 8.



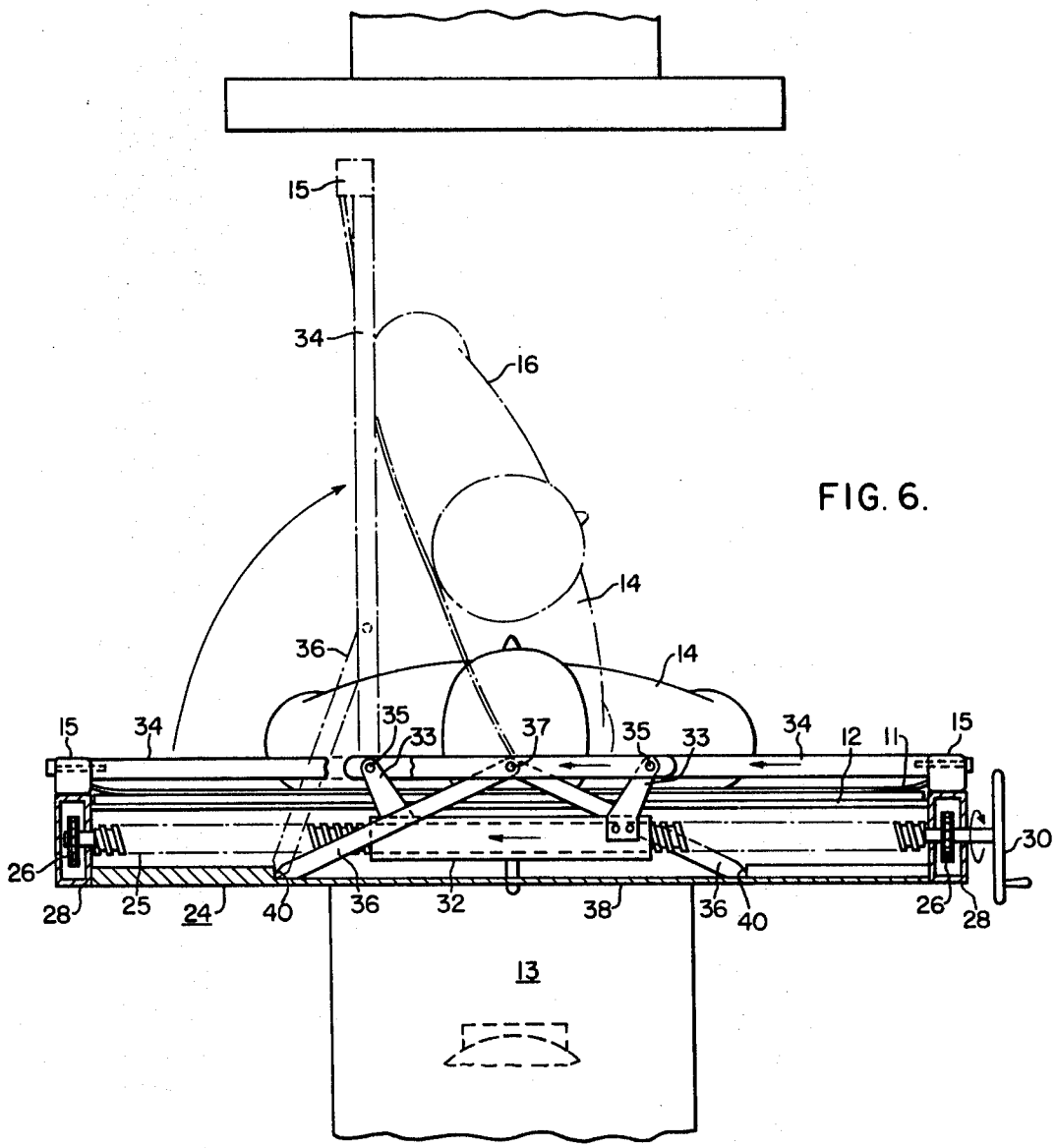

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FIG. 6.

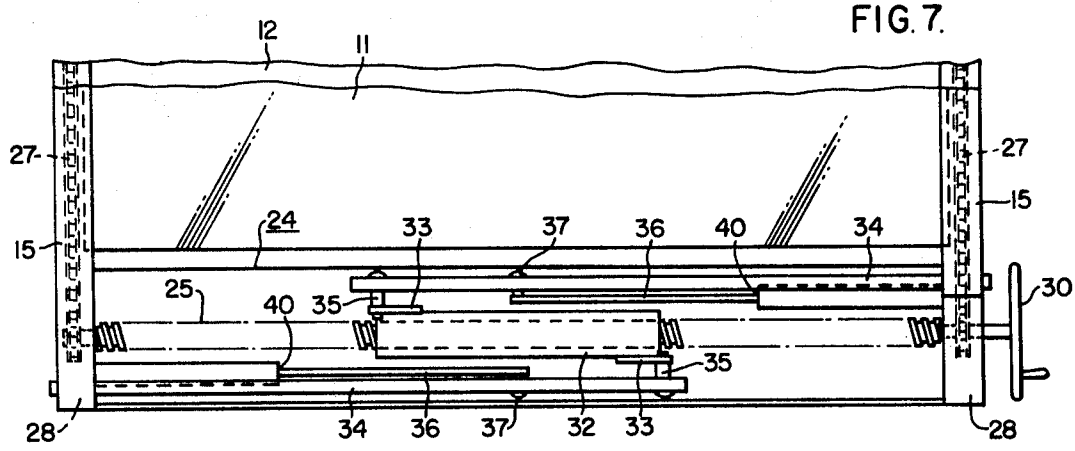

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FIG. 7.

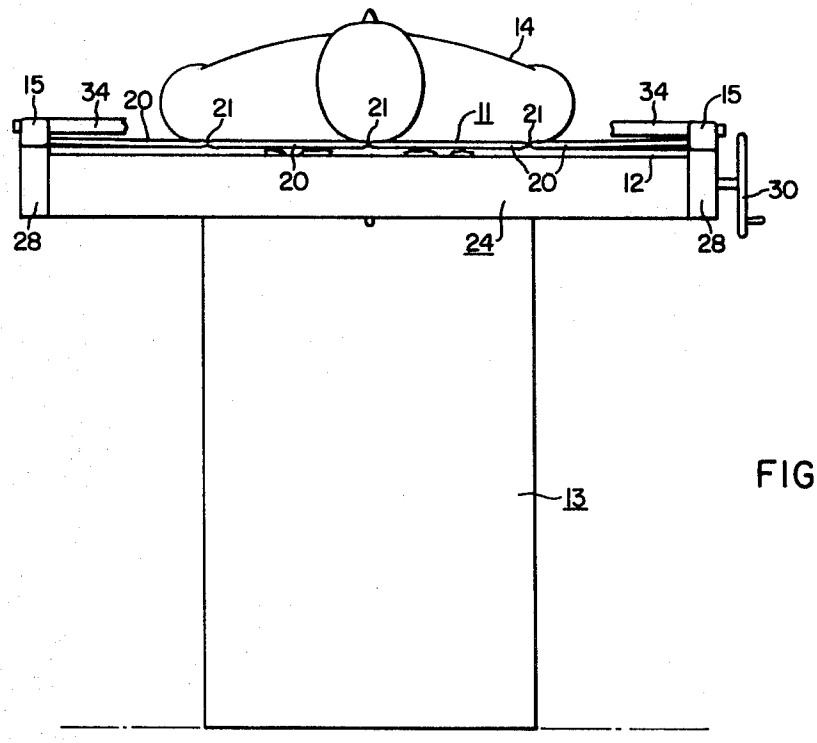

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FIG. 9.

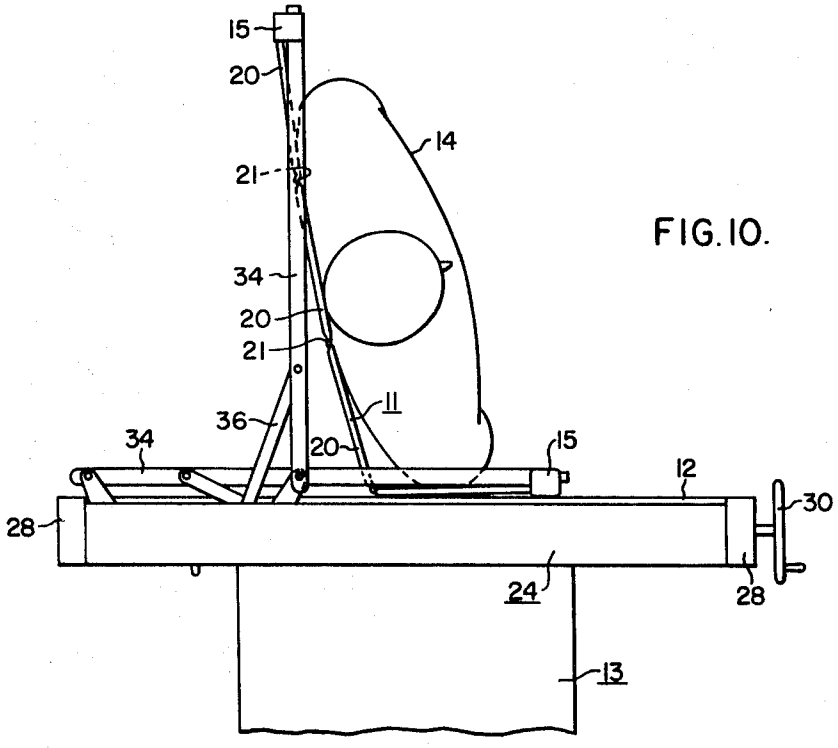

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FIG. 10.

PATIENT-TILTING DEVICE FOR AN X-RAY TABLE

BACKGROUND OF THE INVENTION

1. Field of the Invention

Adjunctive devices for flattop X-ray examination tables to obtain tilting or turning of the patient relative to the tabletop about an axis extending lengthwise of such top.

2. Description of the Prior Art

Previous patient-tilting devices for addition to flat X-ray examination tabletops of which I am aware provide for support of the patient above and independently of the tabletop. When these devices are inactive and use of the tabletop for patient support is desired, the obstruction presented by such devices requires their removal from the table. In addition, the nature of the support afforded by many of such devices often imposes considerable reliance upon constraint bands to retain the patient in the device in tilted attitudes.

SUMMARY OF THE INVENTION

The patient-tilting X-ray tabletop device of the present invention, in employing a thin edge-raisable flexible member, normally resting completely on the tabletop panel in conformity with the shape thereof for tilting the patient, permits the top of the table to remain relatively unobstructed, thereby affording a convenience in uses where the patient-turning device is not required or desired, and the patient receives support by the tabletop beneath the flexible member along his side while being tilted. Also, by inclusion of actuating means for such flexible member which slides its lower edge inwardly on the tabletop panel while the other edge is being raised, such side support for the patient while tilted onto his side is preserved even at the steeper tilt attitudes while also being maintained at least substantially centered on the tabletop.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a plan view in outline showing one exemplified embodiment of the patient-tilting device of the present invention in a retracted position, in association with an X-ray examination table;

FIG. 2 is an end elevational view of the assemblage in FIG. 1;

FIG. 3 is a fragmental side elevation view of the assemblage in FIG. 1;

FIG. 4 is a fragmental side elevation view in outline showing a modification of the novel patient-tilting device in affiliation with an X-ray examination table in a manner differing from that of the preceding figures;

FIG. 5 is an end elevational view of the assemblage in FIG. 4;

FIG. 6 is an end elevation view, partly in outline and partly in section, showing structural details of the patient-tilting device embodied in showings in the previous figures;

FIG. 7 is a top view, substantially in outline, of the device in FIG. 6;

FIG. 8 is a fragmental top view in outline of the patient-tilting device shown in the preceding drawings in the one extreme patient-tilting position shown in elevation by dotted outline in FIG. 6; and

FIGS. 9 and 10 are end elevation views of an alternate construction of the patient-tilting device of the present invention, shown in affiliation with an X-ray examination table in fully retracted and extreme tilt positions, respectively.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to FIGS. 1 to 8, the patient-tilting device of the present invention comprises a thin, flexible, semistiff, X-ray-transparent, normally flat, sheetlike patient-tilt member 11 which normally rests substantially completely on the upper surface of the top panel 12 of an X-ray examination table 13 in conformity with the shape thereof, which is usually flat as shown in the drawings. In such normal repose position of the patient-tilt member 11 on the top panel 12 of the X-ray table 13, such member readily accepts the patient 14 thereon in a supine attitude as indicated by the solid outline of FIG. 6. By raising one side edge of the patient-tilt member 11, which extends along the length of the tabletop, through the medium of a respective rigid side rod 15 attached to one side edge of such member, the patient 14, can be caused to tilt about his one side which remains supported by the top panel 12 of the table 13 through the medium of the immediately overlying respective portion of the tilt member 11 remaining in contact therewith. The dot-dash outline 16 of a patient 14 shown in FIG. 6 illustrates an extreme tilt attitude of the patient obtainable by employment of the device of the present invention, but it will be appreciated that by selective degrees of raising of the one side of the tilt member 11, any selective intermediate position between the two shown in FIG. 6 may be obtained. At the same time that the patient 14 is tilted by raising one side edge of the patient tilt member 11, the apparatus of the present invention also provides for sliding the other edge of such patient tilt member 11 inwardly from the edge of the tabletop panel 12 to assure the maintaining of adequate support of the patient by the top panel as the patient is being tilted by such member while also substantially maintaining the patient centered with respect to the width of the tabletop.

In FIGS. 9 and 10 is shown the above sliding of one edge of tilt member 11 inwardly during tilting, as well as an alternate construction for the flexible, thin-wall, continuous, sheetlike patient-tilt member 11 of preceding figures which employs a plurality of longitudinally extending relatively rigid members 20 joined by longitudinally extending hinges 21 to afford the lateral flexibility required.

In all the embodiments illustrated herein, the normally flat sheetlike patient-tilt member 11 overlies substantially the entire upper surface of the top panel member 12 of the X-ray examination table 13, and the rigid lift rods 15 for raising one or the other side edges thereof selectively to impose the tilting action on the patient 14 extend for substantially the entire length of such top panel member on or adjacent to the sides thereof, respectively. Disposed at opposite ends of the tabletop panel member 12, either on the upper surface thereof as in FIGS. 4 and 5 or adjacent to the end edges thereof as in FIGS. 1 to 3 there is provided a mechanism 24 for raising opposite ends of one or the other of the lift rods 15 selective degrees while the nonraised opposite side rod 15 is advanced inwardly along the tabletop panel member 12 a degree corresponding to the degree of raising of the other side rod. Each of these mechanisms 24 at the opposite ends of the table 13 is contained in a rigid elongated rectangular housing with open top construction and which is relatively short in height and narrow in width; a matter of no more than a few inches in either dimension and which extends between the two lift rods 15 from one edge of the top panel 12 to the other.

Each of the two lift-rod-actuating mechanisms 24 at opposite ends of the table includes a screw-threaded shaft member 25, FIGS. 6, 7 and 8, which extends through the housing to sprocket wheels 26, FIG. 6, at opposite ends which are disposed in housing portions normally lying beneath the rod members 15. The sprocket wheels 26 at one side of the table 13 are coupled together for rotation in unison by a loop of chain 27, FIGS. 7 and 8, extending along an edge of the tabletop 12 and enclosed within a chain housing 28, while the same is true for the sprocket wheels 26 at the opposite edge of the table. Such as an operator's crank wheel 30 is provided for effecting turning of the screw-threaded shafts 25 of the two actuating mechanisms 24 in unison. An electric motor, or other suitable means, may be substituted for the hand crank 30 if desired.

In each actuating mechanism 24, turning movement of the screw shaft 25 imparts longitudinal movement to an internally threaded member 32 which is thereby caused to move axially along such screw shaft and hence widthwise of the tabletop panel 12. Referring to FIGS. 6, 7 and 8 the internally threaded screw follower member 32 includes two anchor arms 33, one at each end which project upwardly and are pivotally con-

nected via pins 35 at their uppermost ends to respective ends of actuating lever arms 34 rigidly connected at their opposite ends to the lift rods 15. The anchor arms 33 on the screw follower member 32 at opposite ends thereof are at opposite sides of such screw follower member as shown in FIG. 7, and the actuating lever arms 34 pivotally connected thereto and attached to the lift rods 15 are similarly disposed at opposite sides of such screw follower member and extend in opposite directions therefrom. During movement of the screw follower member 32 in one direction or the other according to direction of rotation of the crank wheel 30 by the operator, pivot pins 35 on the arms 33 for the actuating lever arms 34 affiliated with such screw follower member 32 travel with it. In the normally flat attitude of the patient-tilt member 11, as shown in solid outline in FIG. 6 for example, the actuating lever arms 34 for the lift rods 15 extend horizontally between such rods substantially in a common plane therewith and in parallel with the upper surface of the tabletop panel 12.

For each of the actuating lever arms 34 is a respective tiltable fulcrum lever 36 which is pivotally connected at an uppermost end via a pin 37 to the respective actuating lever arm at a point about one-third of its length away from its pivot pin 35 and extends downwardly therefrom into slidable engagement with a bottom wall 38 of the housing. In the inactive repose position of the mechanism, in which it is shown in solid outline in FIGS. 6 and 7, the two tiltable fulcrum levers 36 extend generally downward in opposite directions. Their lowermost ends occupy positions against or near respective stop shoulders 40 affiliated with the bottom wall 38 portion of the housing, and the two pivot pins 37 for the upper ends of such fulcrum levers 36 are in axial alignment midway between the two lift rods 15.

Referring particularly to FIGS. 6, 7 and 8, in operation of the patient-tilting device of the present invention, the operator's hand crank 30 will be turned in one direction or the other according to the direction of tilting of the patient desired. In one direction of rotation the screw shaft 25 the follower member 32 will be caused to advance to the left, for example, as in FIG. 6 and cause the pivot pins 35 affiliated with the rod actuating levers 34 to move along therewith. Such movement of the left-hand pivot pin 35 will cause the right-hand actuating lever 34 to move therewith and pull the right-hand lift rod 15 along with it. At the same time, such movement of the right-hand actuating arm 34, through the medium of the respective pivot pin 37 drags the right-hand fulcrum lever arm 36 along with it as its lowermost end slides along the bottom wall 38 of the housing in a direction away from the right-hand pivot stop shoulder 40. Also at the same time, the leftward movement of the right-hand end of the left lift rod actuating lever 34 causes the left-hand fulcrum lever 36 to pivot about the left-hand stop shoulder 40 and swing in a counterclockwise direction as viewed in FIG. 6 while causing the left lift rod actuating lever arm 34 to swing upwardly in a clockwise direction about the right-hand pivot pin 35. Such clockwise rocking movement of the left side lift bar actuating lever arm 34 raises the left side lift rod 15 and lifts the left-hand edge of the flexible patient-tilt member 11 upwardly to tilt the patient 14 resting thereon while his right side tends to roll on such tilt member which is maintained supported thereunder by the top panel 12 of the table while being slid leftward along such top panel by movement of the right side lift rod 15. The dot-dash lines in FIG. 6 and solid lines in FIG. 8 show the left side lift rod 15 in an extreme tilted position with the actuating lever arm 34 therefor extending vertically above the tabletop Any selective degree of tilting of the patient between the supine and the tilted attitudes shown in FIG. 6 may be obtained by controlling the degree of turning of the hand crank 30, or operation of a motor which may be substituted for such crank. It will be appreciated that the mechanism as shown in FIG. 6 is duplicated at the opposite end of the table and such duplicate mechanism is simultaneously operated through the medium of the loop chains 27 at opposite sides of the table which rotarily couple the respective sprocket wheels 26 affiliated with the two mechanisms. In raising of a selected side lift rod 15, therefore, lift effort is imparted to such rod at its opposite ends simultaneously, and side lift rods 15 are designed to have the rigidity necessary to assure integrity of their shape during operation of the device.

In the arrangement shown in FIGS. 4 and 5, where the entire device including the two mechanisms 24 at the opposite ends of the table 13 are disposed on the upper surface of the top panel member 12 of the table, the rigid side lift rods 15 for raising the side edges of the normally flat flexible patient-tilt member 11 preferably will be angulated downwardly in the immediate vicinity of the actuator mechanisms 24 to minimize obstruction of the side edges of the tabletop presented by such side rods. This arrangement where substantially the entire device is disposed on top of the top panel member 12 of the table 13 may be particularly desireable where a longitudinal movement of the top panel member 12 relative to various longitudinal and cross-carriage members is provided.

I claim:

1. A patient-tilting device for an X-ray examination table, comprising,

a normally horizontal, generally rectangular, substantially flat, rigid top panel member on said table for full-length support of a patient in a supine position,

a thin normally flat laterally flexible X-ray transparent patient-tilt member normally overlying substantially the entirety of said top panel member substantially in continuous contiguous support thereby,

a rigid elongated side lift member extending along at least substantially the full length of one edge of said top panel member, normally disposed immediately adjacent thereto, and attached to the respective side edge of said patient-tilt member, and

actuating means connected to said elongated side lift member operable to raise same upwardly from said top panel member to lift the respective side edge of said patient-tilt member and thereby tilt the patient normally resting supine thereon.

2. The patient-tilting device as set forth in claim 1, wherein said patient-tilt member is in form of a continuous member of flexible material.

3. The patient-tilting device of claim 1, wherein the patient-tilt member is in form of thin rigid elements joined together by longitudinally extending hinge means which afford the lateral flexibility.

4. The patient-tilting device of claim 1, wherein said actuating means is in dual form, disposed at opposite ends of said patient support member, respectively, and each comprises,

a narrow elongated housing means extending widthwise of said top panel member,

a screw-threaded shaft extending along each of said housing means,

a screw follower member in screw-threaded engagement with said shaft arranged for longitudinal advancement therealong by shaft rotation,

an actuating lever arm attached at one end to a respective end of said rigid side lift member and pivotally connected at its opposite end to said follower member, and

a fulcrum lever arm pivotally connected at an upper end to said actuating lever arm and at a lower end to said housing means, and, wherein said device further comprises

means directly connected to one screw-threaded shaft for turning same, and

chain-and-sprocket means interconnecting the screw-threaded shaft in the one actuating means with that in the other for operation of the two shafts in unison.

5. The patient-tilting device of claim 1, further comprising,

a second rigid elongated side lift member similar to the first slide lift member and attached to the other side edge of the patient-tilt member, and

wherein the patient-tilt member in the region of such other side edge is relatively stiff, and

the actuating means further operates to advance the second side lift member laterally of the top panel member in unison with raising of the first side lift member, to thereby slide the nonraised side edge of the patient-tilt member inwardly on the top panel member.

6. The patient-tilting device of claim 1, further comprising,

a second rigid elongated side lift member similar to the first side lift member and extending along the other edge of the top panel member and attached to the other side edge of the patient-tilt member, and

wherein the actuating means is operative to raise either of the two side lift members selectively while simultaneously moving the other of such members inwardly sidewise along the top panel member.

7. The patient-tilting device of claim 6, wherein said actuating means is in dual form, disposed at opposite ends of said patient support member, respectively, and each comprises,

a narrow elongated housing means extending widthwise of said top panel member,

a drive member movable rectilinearly along the length of said housing,

a pair of actuating lever arms attached at their one end to respective ends of the rigid side lift members and at their opposite ends being pivotally connected to said drive member,

a pair of fulcrum lever arms pivotally connected at upper ends to the actuating lever arms, respectively, intermediate their opposite ends and normally extending downwardly and sidewardly in opposite directions one with respect to the other,

a pair of stops affixed to said housing means constructed and arranged to be engaged by the lowermost ends of said fulcrum lever arms, respectively, during movement of said drive member in respective directions, to act as pivot points about which such fulcrum lever arms may rock, and away from which such fulcrum lever arms are free to move during reverse directions of drive member movement, and

means extending along and below the upper surface of said top panel member, for coupling the movement of the drive member in the one actuating means with that in the other.