July 16, 1957 E. J. RASKA ET AL 2,799,542

TILT TABLE FOR X-RAY TECHNIQUES

Filed Jan. 7, 1955 4 Sheets-Sheet 1

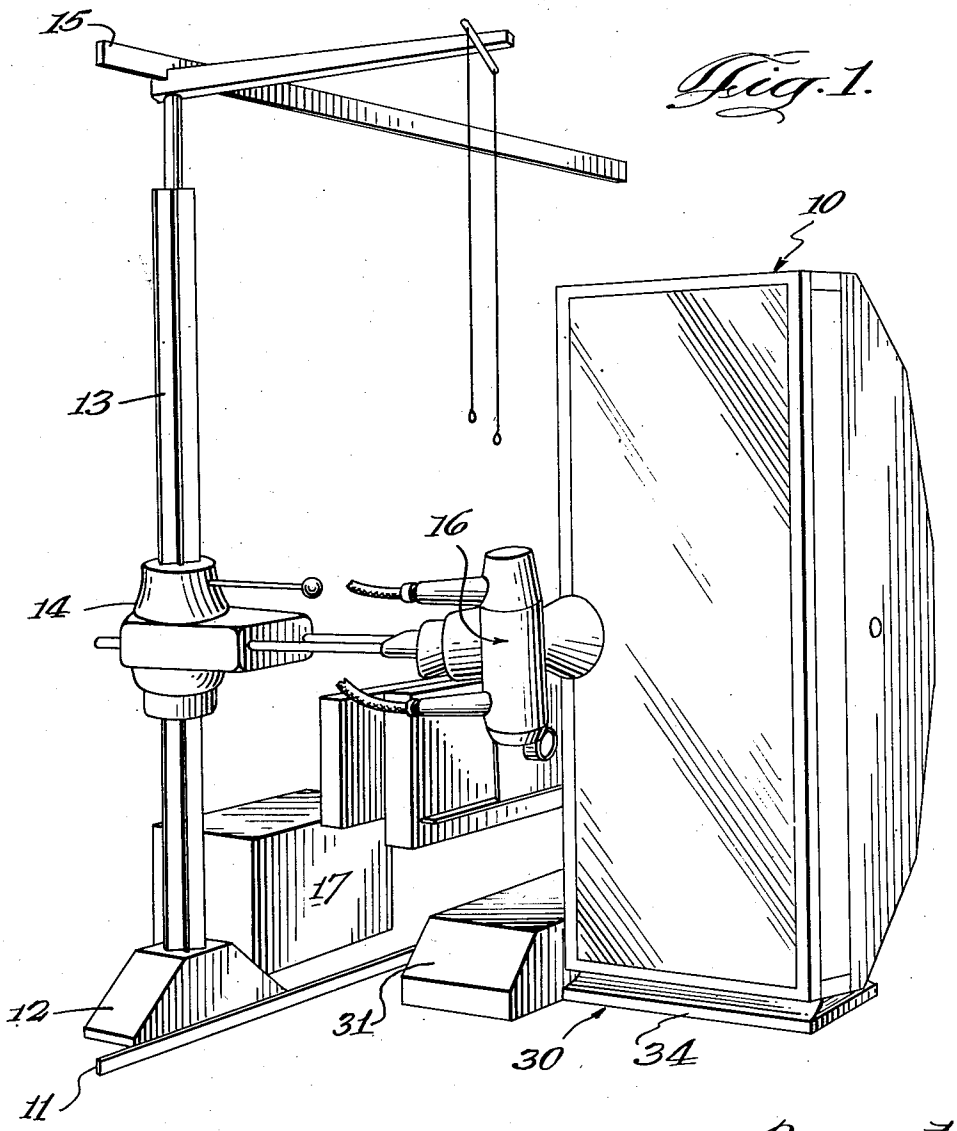


Fig. 1.

Inventors
Edward J. Raska
Louis R. Baldino

By Silverman & Mullin
Attorneys

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TILT TABLE FOR X-RAY TECHNIQUES

Filed Jan. 7, 1955 4 Sheets-Sheet 2

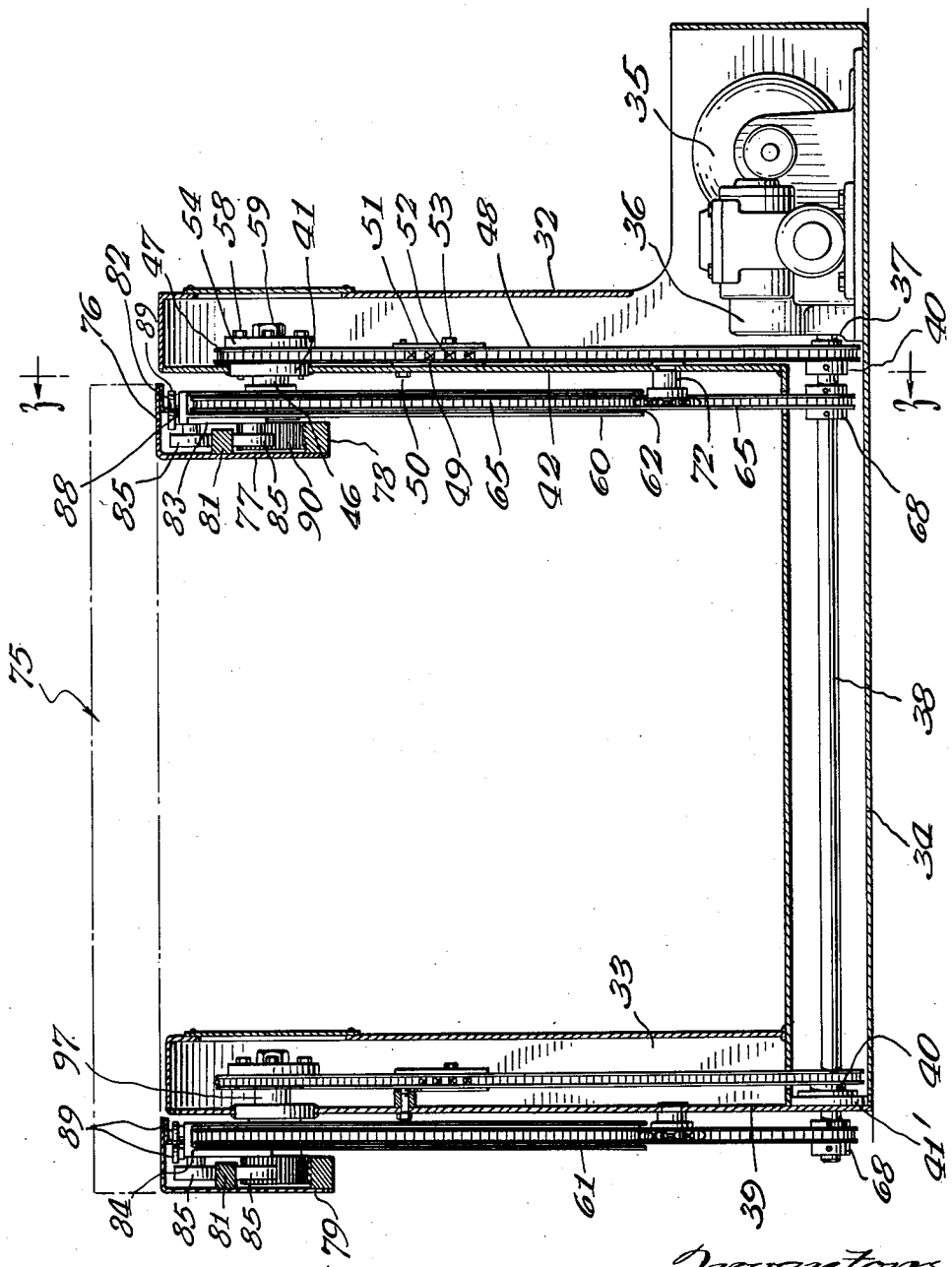


Fig. 2.

Inventors
Edward J. Raska
Louis R. Baldino
By Silverman & Mullin
Attorneys

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TILT TABLE FOR X-RAY TECHNIQUES

Filed Jan. 7, 1955 4 Sheets-Sheet 3

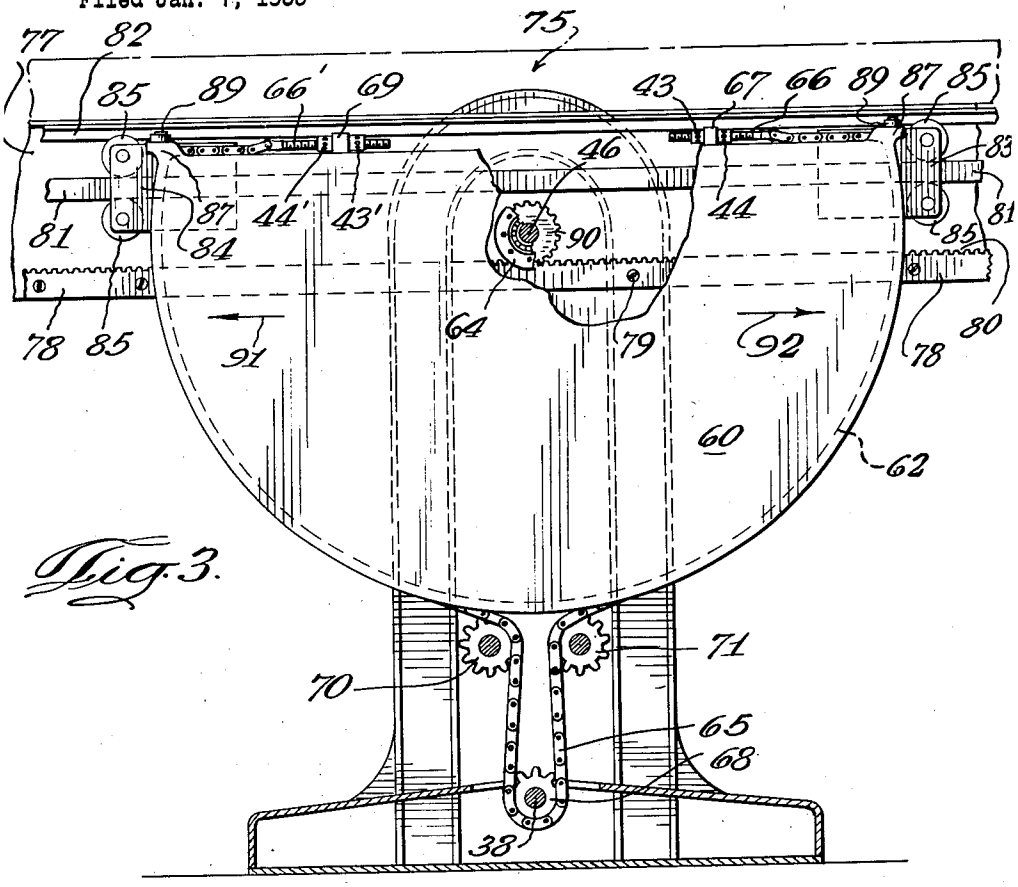


Fig. 3.

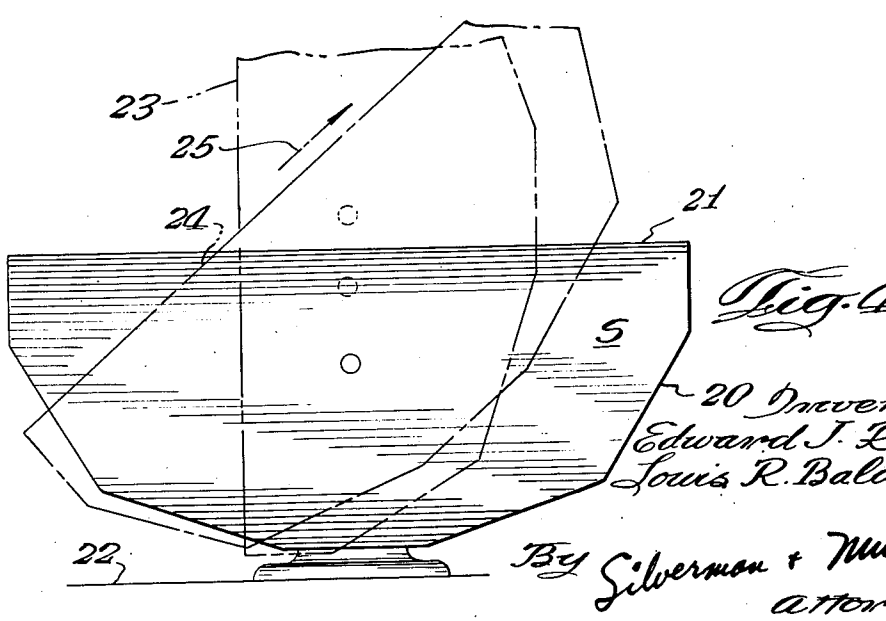


Fig. 4.

20 Inventors
Edward J. Raska
Louis R. Baldinco

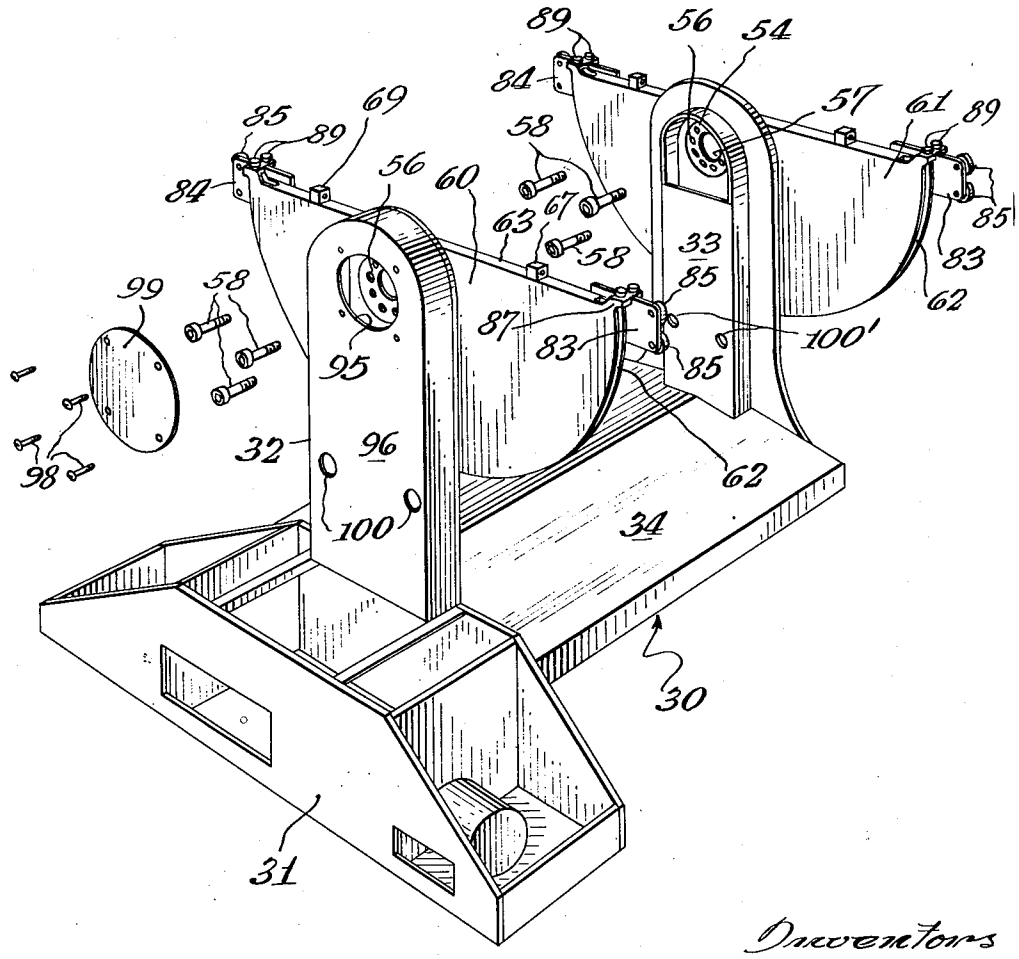
By Silverman & Mullin
attorneys

July 16, 1957 E. J. RASKA ET AL 2,799,542

TILT TABLE FOR X-RAY TECHNIQUES

Filed Jan. 7, 1955 4 Sheets-Sheet 4

Fig. 5.



Inventors
Edward J. Raska
Louis R. Baldino
By Silverman & Mullin
Attorneys

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2,799,542

TILT TABLE FOR X-RAY TECHNIQUES

Edward J. Raska, North Riverside, and Louis R. Baldino, Chicago, Ill., assignors to Continental X-Ray Corporation, Chicago, Ill., a corporation of Illinois

Application January 7, 1955, Serial No. 480,552

7 Claims. (Cl. 311—6)

This invention relates generally to X-ray apparatus and more particularly relates to a novel and unique construction for a tilt table for radiography, fluoroscopy and myelography techniques.

The use of the tilt table in radiography, fluoroscopy and myelography has heretofore been attended with some difficulties whose effect is attributable principally to apparatus limitations. In order to perform with maximum efficiency and to meet the requirements of modern practice, it is essential that a table be of full length, to support the patient; be capable of immediate and positive movement between vertical, horizontal and various Trendelenburg positions without overrun or backlash; and be arranged when in horizontal position at a height above the floor which will enable a patient to be placed thereon and removed therefrom and manipulated thereon with ease.

The primary object of the invention is the provision of a structure capable of accomplishing the above purposes.

The normal height of a tilt table is considerably less than half its normal length, and hence in order to tilt a table, say from horizontal to vertical position, complex and expensive structures have heretofore been required. For example, large and bulky circular frameworks were used; elevator mechanisms for raising the tables were used; and/or in general modifications were made which decreased the versatility and usefulness of the equipment.

A very important object of the invention is therefore the provision of a tilt table of relatively low height which is movable between vertical position to horizontal and Trendelenburg and back by simple apparatus which translates the table relative to its rotational axis, simultaneous with rotation thereof.

By virtue of providing a tilt table for X-ray apparatus of the character described, it will be apparent that the said tilt table will be suitable for use in both radiography and fluoroscopy techniques and hence, it is an object of the invention to provide such a tilt table capable of being associated with radiography and fluoroscopy equipment in a single piece of equipment. This object is further enhanced in that the tilt table embodying the invention is also suitable for use in myelography techniques.

In the latter mentioned technique, an organic dye is injected into the spinal column of the patient, the particular dye being opaque to X-rays. The patient is supported supine on the tilt table, front and back, and the table is kept in continuous swing; myelography techniques require immediate tilting of the table and continuous swing since if there is any stopping of the swinging movement of the table, it could be fatal to the patient. A further object of the invention is to provide a tilt table as described also suitable for such techniques by reason of its being capable of continuous swinging movement without complicated shifting mechanisms even into vertical position.

Tilt table apparatus installations, while usually fairly permanent, are nevertheless required to be installed and maintained, very often, by persons not intensively trained in such mechanisms. This invention has as additional

objects the provision of a tilt table which is extremely simple and made of few parts, and hence is fairly portable and easy to install and disassemble; the provision of tilt table apparatus in which the table panel is supported on a carriage having two depending bracket plates cooperating with two vertical standards secured to a base and in which the bracket plates are disposed respectively to one side of the standards to enable ready assembly, service and disassembly; the provision of tilt table apparatus having a novel suspension for the table panel and carriage.

The prior art has shown apparatus which has a table translated while being rotated, but so far as we are aware there has been no successful embodiment marketed other than the table of this invention. The apparatus of this invention is characterized, among other things, by a novel structure for translating the table panel during rotation which substantially eliminates binding and friction of gears and hence decreases wear thereof. In the invention, the table panel is confined, guided and supported by a novel suspension system of rollers, and there is provided a rack below the suspension which faces upward and is engaged by a gear whose sole purpose is to move the rack rather than support the same. It is an important object of the invention to provide such an arrangement of parts, since, in addition to the advantages referred to, the gear and rack are completely hidden and hence the apparatus is safe and clean; the table is low compared to prior devices because the center of rotation and the translating mechanism are capable of being spaced below the table panel a substantial distance; the rack is simply a strip which is secured to the side of the bracket plate of the carriage, making for easy installation and fabrication.

With the foregoing and other objects in view which will appear as the description proceeds, the invention consists of certain novel features of construction, arrangement and a combination of parts hereinafter fully described, illustrated in the accompanying drawings, and particularly pointed out in the appended claims, it being understood that various changes in the form, proportion, size and minor details of the structure may be made without departing from the spirit or sacrificing any of the advantages of the invention.

For the purpose of facilitating an understanding of this invention, there is illustrated in the accompanying drawings a preferred embodiment thereof, from an inspection of which, when considered in connection with the following description, this invention, its mode of construction, assembly and operation, and many of its advantages should be readily understood and appreciated.

Referring to the drawings in which the same characters of reference are employed to indicate corresponding or similar parts throughout the several figures of the drawings:

Fig. 1 is a perspective view showing X-ray apparatus having the tilt table embodying the invention associated therewith, the table being shown in a vertical position.

Fig. 2 is a vertical section taken through the base assembly of the tilt table to show the table drive mechanism, the table top being shown in broken lines.

Fig. 3 is a sectional view taken along the line 3—3 of Fig. 2 and in the direction indicated.

Fig. 4 is a diagrammatic view showing the manner of movement of the table longitudinally during rotation thereof for providing clearance of the floor.

Fig. 5 is a perspective view of the base assembly of the invention, certain parts being illustrated exploded to show specific details of construction.

Referring to the drawings, the tilt table embodying the invention is designated generally by the reference character 10, same being shown associated with certain X-ray equipment in Fig. 1. The X-ray equipment shown in

Fig. 1 is well known and does not comprise a part of the invention. There is shown the floor rail **11**, tube stand **12** supporting the vertical track **13**, the tube support **14** slidably mounted on the track and tube stand ceiling rail **15**. The tube and associated equipment has been designated generally **16** shown supported on the tube support **14**. Fluoroscopy equipment (not shown) easily could be installed or substituted. The transformer commonly used in X-ray apparatus is designated **17**. The X-ray equipment described is assembled for operation adjacent the tilt table **10** in a well known manner and it is deemed unnecessary to further describe the same or show additional details in the drawings in the interest of keeping the disclosure readily understood and uncomplicated.

As shown in Fig. 1, the table **10** is in vertical position behind the tube **16**. In this position, the tilt table which is a full length model, is in proper position for vertical radiography techniques. As shown in Fig. 4, the horizontal position of the table is shown in solid outline designated **20** and the length of the table top **21** will be seen to be greater than twice the distance between table top **21** and floor **22**. In most prior art structures, to rotate the table to the vertical position shown in Fig. 1 and in phantom outline designated **23** in Fig. 4, the distance of the top **21** from the floor would have to be increased in order to provide clearance of the floor because of the greater length of the table. Heretofore, this could be done by means of suitable elevator apparatus or by complex equipment which is here eliminated. Otherwise one could decrease the length of the table in relation to the height thereof sufficient to provide clearance of the floor. In this invention, neither expedient is employed.

In this invention the table is low and its length normal, and yet the same is capable of being readily tilted, even to a vertical position without the use of complex mechanisms. In Fig. 4, the vertical position is shown in broken outline **23** and an intermediate position is designated **24**. As the table is moved from full line position to either of the broken line positions, while rotating the panel is translated in the direction of the arrow **25**. This is capable of accomplishment notwithstanding the low table height because of a novel suspension comprising horizontal and vertical rails on the table carriage running along the length of the table engaged by rollers carried by rotatable side plates. Also contributing to this is structure consisting of upwardly facing elongate racks spaced below the suspension and engaged by pinions rotating in synchronism with the side plates. All of this will be fully explained hereinafter.

For purposes of rendering the description easier to follow, the table embodying the invention may be considered to be comprised of the following principal parts: a table base assembly, a table drive mechanism, a table panel and a carriage for the table panel. The order in which the parts have been specified is not intended to delineate order of importance or measure their contribution in the invention.

The table base assembly is designated generally **30** in Fig. 5. Same is constructed of sheet or plate steel members welded together to afford increased strength and rigidity. The base assembly includes a bottom housing **31**, a pair of vertically arranged spaced apart standards **32, 33** and a horizontally arranged hollow bottom support section **34** for the standards. The housing **31** is compartmentized to receive an electric motor **35** (shown in Fig. 2), and cover members (not shown) are contemplated for covering the compartments shown exposed in Fig. 5. The standards **32** and **33** are generally of elongate, hollow, box-like formation so as to provide space for receiving therein parts of the table drive mechanism, the particular configuration thereof shown in the drawings being non-restrictive.

The table drive mechanism includes the motor **35** supplied with energy from a conventional A. C. source. Motor **35** is connected to a gear reduction system **36**, the

output shaft **37** of which is connected to drive the countershaft **38**. Countershaft **38** is housed in the section **34** spanned between the standards **32** and **33** with the free end of the shaft protruding through wall **39** of standard **33**. Adjacent each end of countershaft **38** is secured a sprocket wheel **40** which rotates with said countershaft. In the assembly, the sprocket wheels **40** are positioned on the countershaft so that each is disposed in alignment respectively with the hollow chambers of the standards. The shaft is suitably journalled by pillow blocks and/or bearings such as for example bearing **41'**. There is a chain drive housed in each of the standards driven from one of said sprocket wheels **40**. In connection with the said chain drives, it is pointed out that each is substantially identical in construction to the other, so that for purposes of description, only that contained in the standard **32** as shown in Fig. 2 need be described in detail. Likewise, the standards **32** and **33** are quite similar in construction.

The standard **32** is constructed to provide a bearing **41** in wall **42** adjacent its upper end for a shaft **46** which is driven by a sprocket wheel **40**. Portions of the shaft **46** are located both on the interior and exterior of standard **32** and mounted for free rotation on the interior portion of shaft **46** is a sprocket wheel **47**. A sprocket chain **48** is looped between the wheel **47** and its associated wheel **40**. There is a plate **49** secured to the inside surface of wall **42** at a point intermediate the paired bearing **41** and sprocket wheel **40** by means of the fastener bolt **50** and a second plate **51** spaced from and opposite plate **49**, the plates **49** and **51** providing support means for mounting a plurality of idler wheels **52**. The sprocket chain **48** is engaged over the idler wheels **52** which are intended to be adjustable in position in a direction lateral to the sprocket chain so that the tension of the chain may be varied by movement of the idler wheels. This may be accomplished by providing suitable slots in the plates **49** and **51** in which the shafts supporting the idler wheels may be moved and then fixed in desired position by means of nuts on such shafts such as shown at **53**.

Since the sprocket wheel **47** is freely rotatable on the shaft **46**, there is provided a plate **54** which is keyed to the shaft driving said wheel **47** when shaft **46** is rotated. The plate **54** is provided with a plurality of radially aligned, circumferentially spaced openings **55**, and a central passageway **57** through which shaft **46** is received. Plate **54** is secured to the sprocket wheel **47** by bolts **58** shown in Fig. 5. Similar threaded openings are provided in sprocket wheel **47** which have not been shown in detail although they will be understood to be required in view of eventual securement thereto of plate **54** for rotating said sprocket wheel. The end of shaft **46** may be threaded to receive nut **59** to hold plate **54** in position. It will thus be seen that as countershaft **38** is rotated by motor **35**, sprocket wheel **40** will be rotated causing rotation of the shaft **46** when plate **54** is secured to sprocket **47**.

The specific means for rotating the table will next be described. Said means comprise a pair of plate members **60** and **61** of identical construction, there being a plate member mounted adjacent each standard exterior thereof.

Looking at Fig. 2, it will be seen that each of the plate members **60** and **61** is to the left, that is on the same side, of the standards **32, 33**. Because of this structure the device is relatively simple to fabricate, assemble and service. Parts of the suspension and drive mechanism are identical since no opposite structures are needed. The tilt table has apparatus associated therewith (not shown) which normally prevents rotation of the table panel to a 90° position opposite that shown in Fig. 1, and hence the suspension and drive mechanism may not be symmetrical along the length of the table on opposite sides of center. Thus it is advantageous and economical that parts on opposite sides of the table be substantially identical.

Considering the plate **60**, same is of sector configuration. The peripheral curved edge is provided with a groove **62** extending from opposite ends of the straight edge **63** of said plate **60**. The plate **60** has a bearing **64** spaced midway between ends of straight edge **63** and inwardly thereof by means of which same is journalled on shaft **46**. Plate **60** is mounted for free rotation about the shaft **46** exterior of the standard **32** adjacent the wall **42** thereof as explained. Likewise plate **61** is journalled for free rotation on shaft **97** exterior of standard **33**. There is provided a sprocket chain **65** which is secured at one end to a threaded rod **66** that passes through an opening in a block **67** secured to the straight edge **63** and is prevented from being withdrawn by the nut **43** and lock nut **44**. The chain **65** passes around the right half (Fig. 3) of the peripheral groove **62**, over sprocket wheel **68** which is secured to countershaft **38**, around the left half of the peripheral groove **62**, and back up to the straight edge **63**. At this point the chain is secured to a threaded rod **66'** which passes through the block **69** and is held secure by nut **43'** and locking nut **44'**. The reach of the chain **65** is also passed over a pair of spaced apart idler sprockets **70** and **71** which are mounted on wall **42** exterior of the standard **32**. A typical bearing shaft mounting an idler sprocket is shown at **72** in Fig. 2, the idler sprockets being arranged to receive the reach of chain **65** passed therebetween and then over sprocket wheel **68** as shown in Fig. 3.

When counter-shaft **38** is rotated, the sprocket wheel **68** will be rotated causing movement of the chain **65**. As viewed in Fig. 3, since the ends of the sprocket chain **65** are secured at opposite extremities of upper straight edge **63**, the plate **60** will be rotated in the direction in which countershaft **38** rotates. Rotation of shaft **46** will not interfere with rotation of plate **60** since plate **60** is rotatively journalled on shaft **46**. To permit rotation of plate **60** in either direction, the motor **35** is of the reversible type and suitable operating switches are provided on the table **10** within convenient reach of the operator to reverse the motor **35** at will. The tension of the chain **65** may be adjusted as desired by means of the nuts **43** and **43'**. Tension of sprocket chain **48** is adjusted as described above by means of idler wheels **52**.

The table panel is designated generally **75** in Figs. 2 and 3 and is supported on the plates **60** and **61**. Since there are two plates **60** and **61**, two support structures are provided. However, the support structures are substantially identical in construction so that only one need be described in detail. Together these supports form the carriage for the table. The table panel **75** includes a table surface to the underside of which, adjacent each longitudinal side edge is secured a heavy L-shaped bracket plate **76** having a depending wall **77**. In the practical embodiment the table wall **77** extends considerably further downward than illustrated. The table includes a housing for considerable apparatus (not shown) which is usually associated with equipment of this kind. The front wall **79** may have an ornamental skirt S secured thereto. Plate **76** is in the nature of a track support substantially co-extensive with the length of the panel **75** and secured along the wall **77** spaced from the top thereof is a rack **78**. The teeth **80** of the rack extend normal to the wall **77** and are presented upward when the table is horizontal. As shown in Fig. 3, there is an elongate protruding guide bar or horizontally extending track **81** coextensive with the length of depending wall **77** secured to wall **77** and spaced above the rack **78**. Depending from the bracket plate **76** is a flange or vertically extending track **82** substantially shorter than wall **77** and spaced inwardly therefrom. Again it is emphasized that there are two such plate brackets **76**, one along each side of the panel **75**, there being a bracket plate for each plate **60** and **61**.

It is also desired to emphasize that the bracket plates **76** cover the suspension and driving mechanism by reason of their L-shaped construction, and that the depending portions **77** and **79** are to one side of the standards. It is further of importance that the rack **78**, track **81**, and track **82** are secured on the interior of the L-shaped bracket plate, with the rack spaced below the track and having its teeth upward. Obviously the same structure is found in the opposite bracket.

Cooperating means of identical construction for supporting panel **75** are provided on each of plates **60** and **61** to engage with the support brackets **76**, **76**. Considering plate **60** as shown in Fig. 5, there are a pair of oppositely extending bars **83** and **84** secured on opposite ends of the straight edge **63** and protruding outwardly of curved groove **62**. Each bar **83** and **84** is arranged with its upper edge parallel with straight edge **63**. On the protruding portions of each bar **83**, **84** is mounted a pair of spaced apart guide rollers **85** rotative on parallel axes perpendicular to the plane of the plate **60**.

Referring to Fig. 2, protruding beyond the straight edge **63** is a bracket **87** secured to plate **60**, bracket **87** having a part **88** overhanging straight edge **63** and spaced therefrom. Mounted on the upper surface of said part **88** are a pair of spaced apart guide rollers **89**, **89**. It should be understood that a plurality of such rollers **89**, **89** may be provided spaced along the straight edge **63** at desired intervals. The groove **62** is continued under the bracket **87** so that the sprocket chain **65** may pass on to straight edge **63**. The axes of rotation of said rollers **89** are perpendicular to the axes of rollers **85**.

The table panel is arranged on the plates **60** and **61** with the guide bar or horizontally extending track **81** of each bracket plate **76** received in the guide channel between rollers **85** which are mounted on the bars **83**, **84** on each said plate. The depending flange or vertically extending track **82** on each bracket plate **76** is received between rollers **89**, **89** thereby preventing lateral movement of the table panel.

For illustrative purposes, description of the operation of the device will be limited to the drive mechanism housed in connection with standard **32**, it being understood that the same mechanism is provided in the other standard. The shaft **46** has a portion thereof exterior of the standard **32** which is extended through the plate **60** and protrudes beyond said plate. This free end of the shaft **46** has a spur gear **90** mounted thereon for rotation with the shaft. In mounting the table panel **75** on the plates **60** and **61**, the spur gear **90** is positioned in engagement with teeth **80** of rack **78**. The plate **60** is freely rotatable on the shaft **46** and is not affected by the rotary motion of the shaft. As the shaft **46** is rotated, the spur gear likewise will rotate and being in engagement with rack **78**, will cause the table panel **75** to move longitudinally in response to such rotation. As viewed in Fig. 3, when the shaft **46** is rotated in a clockwise direction, spur gear **90** will rotate in the same direction causing translation of table panel **75** in the direction of the arrow **91**. When spur gear **90** is caused to rotate in a counterclockwise direction, the panel **75** will be moved in the direction of arrow **92**.

The suspension of the device is embodied in the means for supporting the table panel **75** upon the carriage **76—76**. The table is confined against lateral movement by virtue of the track **82** confined between rollers **89**. The table panel is confined against vertical movement, but also supported directly by rollers **85** cooperating with track **81** so that there is no weight upon the spur gear **90** or rack **78**. Note that the rack is below the shaft **46** and is not exposed. The front rack is covered by the skirt S and the rear rack is inaccessible during normal use. The patient sees no rollers, tracks or gears. All of the table weight is transmitted to the plates **60** and **61** through rollers **85**.

It thus will be seen that there is provided a tilt table

10 which includes a pair of upright standards providing a housing for drive mechanism and a bearing for a drive shaft at the upper end of each standard. There is a sector-like plate mounted for free rotation on each drive shaft, and a table panel supported on said plates by novel suspension means. The drive shaft is driven through a sprocket chain from a main shaft coupled to a motor of the reversible type. The main shaft is also coupled to tilt the table panel. As the main shaft is rotated in either direction, there is effected rotation of the sector plates causing rotation of the table panel in the same direction as the main shaft. Simultaneously, the drive shaft coupled to the main shaft is caused to rotate to affect translative movement of the table panel in a direction perpendicular to the axis of said bearing. Again it is desired to emphasize that rotation of the table is possible in either direction and longitudinal movement of the table will occur simultaneously in either event, albeit in opposite directions for each direction of angular movement.

It will be seen further that there are novel means for coupling the main shaft rotation to translate the table panel characterized by the rack with upwardly facing teeth as described.

There are several features of the invention which require additional explanation. In the manner of mounting the table panel 75 on the plates 60 and 61, care must be exercised that panel 75 is properly centered relative to the axis of pivot of plates 60 and 61 or the drive shaft 46 of each. Referring to Fig. 5, it will be noted that openings are provided in the standards 32 and 33 opposite the bearing 41 formed therein. Considering standard 32, the opening 95 is shown in wall 96 opposite side wall 42 and a cover member 99 is provided adapted to be removably secured over opening 95 by means of bolts 98 to be threaded into wall 96. The opening 95 permits access into the interior of the standard opposite bearing 41 and the structure associated therewith.

Prior to mounting the table panel, the cover member 97 of each standard is removed. At this stage of the assembly, the plate 54 is disengaged from sprocket wheel 47 whereupon shaft 46 will be free to rotate since it passes through plate 60 for free rotation, and sprocket wheel 47 is loosely mounted on shaft 46.

The novel suspension of the table panel 75 renders the next step quite easy of accomplishment. The entire assembled table panel is slipped between the standards, with the depending parts 77 and 79 to one side of each of the respective standards. The rails or tracks are guided into the spaces between rollers, and the racks 78 are guided to engage the now freely rotatable spur gear 90. Obviously the side plates 60 and 61 are poised in positions in which the straight edges 63 are perfectly horizontal. This can be done because the kinematic connection between the motor and the sprocket chain 65 is irreversible. The table panel is then moved to a centered position relative to the plate 60 which may be done since drive shaft 46 is free to move so long as it is not secured to plate 54. Once the table panel is properly centered relative to the pivotal axis of the plates 60 and 61, the plate 54 is rotated until openings 55 therein are aligned with openings provided in the sprocket wheel 47. The bolts 58 (see Fig. 5) are then driven home locking plate 54 to sprocket 47. At this time, the table panel is properly centered and rotation of drive shaft 46 will cause longitudinal movement of the table panel as countershaft 38 is rotated in either direction.

Referring to Fig. 5, attention is invited to openings 100 shown in wall 96 and similar openings provided in standard 33 at 100'. These openings, in each case, are aligned opposite the idler roller assembly of rollers 52, 52. Adjustment of the tension of sprocket chain 48 may be made through these openings since it is intended as described that rollers 52, 52 be adjustable laterally relative to sprocket chain 48.

The invention as described herein is characterized by great simplicity and positiveness of action. The operator need only have two switch buttons—one for rotation in one direction and one for rotation in the opposite direction. The buttons simply cause energization of the motor either in the forward or reverse direction until the tilt of the table is such as to operate one or the other of limit switches (not shown) which control the extent of table tilt. Since the mechanism is directly coupled, providing the tension in the sprocket chains is adjusted to eliminate any backlash, the movement one way or the other is instantaneously responsive to the depression of one or the other button. The speed reducing mechanism 36 is obviously of the irreversible type—to decrease the rotation of the motor to a value suitable for operating the table. Thus, when the operator releases the push button, the table immediately stops in whatever position it has been moved, but it is ready thereafter for instantaneous movement when the button is again depressed.

Because of the mechanism described, the table is easily transported in knock-down condition, easily set up, and easily maintained and repaired. The support and drive means of the invention and their arrangement make it quite feasible and in fact desirable to form the supporting structure of relatively thin gauge sheet metal, fabricated by welding or the like. The structure is also of great advantage in that the moving parts, while readily and easily accessible are protected and not liable to be interfered with during the normal use and operation of the equipment.

The construction of table panel 75 has not been shown in detail insofar as the X-ray equipment to be carried thereby for radiograph and fluoroscopy techniques since the particular equipment housed therein has no bearing on the invention. It should be understood that the table panel may be provided with suitable guide rails built into it for installing a bucky diaphragm and other equipment as well. The appearance of the table may be embellished with attractive side rails and the surface thereof provided as desired. As shown in Fig. 1, the table 10 may be constructed fully enclosed by suitable panelling of attractive finish. The push buttons or switches for turning motor 35 on and off would be provided within convenient reach of the operator on the table 10. Connection of the motor 35 to a source of electric current may be done by conventional means. Also, the particular X-ray equipment ordinarily positioned adjacent the table 10 can be of any desired type and construction and hence forms no part of the invention for which details have been deemed necessary.

It is desired to emphasize that although there are illustrated two drive shafts 46 and 97 whereby both plates 60 and 61 are rotated separately, it is within the scope of the invention that only one such drive shaft be employed. Thus only one drive mechanism as described would be required for rotating one of the plates 60 or 61, the other plate being so arranged and mounted as to rotate with the driven plate. Also, the base assembly may be modified to provide only a single standard and a single pivotal plate support member for the panel 75.

It is believed that the invention has been described in sufficient detail to enable same to be understood and practiced by the skilled artisan. It is contemplated that various changes in the arrangement, proportion, size and construction of the various parts of the invention may be made without departing from the spirit and scope of the invention. It is therefore intended that the contribution herein made to the arts and sciences be measured in accordance with the scope of the invention as set forth in the claims appended hereto.

We claim:

1. A tilt table for X-ray techniques, which comprises a base having a vertically arranged standard with at least one flat wall, a stub shaft journalled in said wall and having a spur gear on one side of the wall and a driven

member on the other side of the wall, a large planar member mounted on said shaft for free rotation relative thereto and disposed on the said one side of the wall and having a straight edge spaced above the stub shaft when in centered position, a source of rotative power irreversibly connected to rotate said planar member and shaft in the same direction and including separate kinematic connections thereto, a table top, a carriage of generally L-shaped cross section secured to one edge of the table top with the remainder of the top extending outwardly relative to said one side of the wall, one leg of said carriage being over the said straight edge and the second leg being alongside and parallel with the plane of said planar member with said planar member disposed between said other leg and the said one side of the wall, a roller and rail connection between said straight edge and legs confining and guiding translative movement of said table top, and a rack mounted on said second leg spaced substantially from the first leg operatively engaged with the spur gear.

2. A tilt table as claimed in claim 1 in which the kinematic connections include flexible chains, one being connected between the source of rotative power and the driven member, and a second being connected between the source and the planar member.

3. A tilt table as claimed in claim 1 in which the base has a second standard spaced therefrom adjacent the second edge of the table, and said second standard has substantially the same structure mounted thereon as hereinabove described for said first standard, including substantially the same shaft, gear, side wall, planar member, carriage, and the connections thereto as described, the same source of rotative power being common to the two standards and associated mechanism.

4. A tilt table mechanism as claimed in claim 1 in which the legs are each provided with rails, there being one rail arranged with vertical parallel friction faces and one rail arranged with horizontal parallel friction faces, the said straight edge having pairs of spaced apart rollers mounted thereon engaged with said respective rails.

5. A tilt table mechanism as claimed in claim 4 in which the rack has its teeth facing upward when the table is arranged in horizontal disposition.

6. A tilt table which comprises, a pair of column-like vertically arranged standards, a base member, the standards being secured in spaced apart relation upon said base, a table top structure having depending plate members arranged each parallel with and adjacent similarly facing sides of said standards, rails secured to the underside of said table top and to said depending plate members presenting vertical and horizontal friction surfaces, a journal in each standard spaced below the underside of said table top and having a driven shaft in each journal and a sector mounted on the shaft on the same side of each standard and freely tiltable relative to said shafts, each sector having anti-friction devices along the upper edge thereof engaged with the rails of the table top to confine and guide a translative movement thereof, each depending member having an elongate rack thereon spaced from the said underside and each shaft having a spur gear rotatable therewith and engaging the respective racks, a power shaft, irreversible means driving the shaft, and driving connections between the power shaft and each of the sectors and driven shafts to tilt the sectors and translate the table top simultaneously.

7. A table as claimed in claim 6 in which the anti-friction devices are rollers.

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