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Barrett et al.

[11] **3,904,531**

[45] **Sept. 9, 1975**

[54] **X-RAY TABLE WITH BUCKY ELEVATOR**

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[73] Assignee: **General Electric Company,** Schenectady, N.Y.

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[52] **U.S. Cl.** **250/444;** 250/471

[51] **Int. Cl.** **G01n 21/00**

[58] **Field of Search** 250/439, 444, 445, 448, 250/449, 450, 451, 471

[56] **References Cited**

UNITED STATES PATENTS

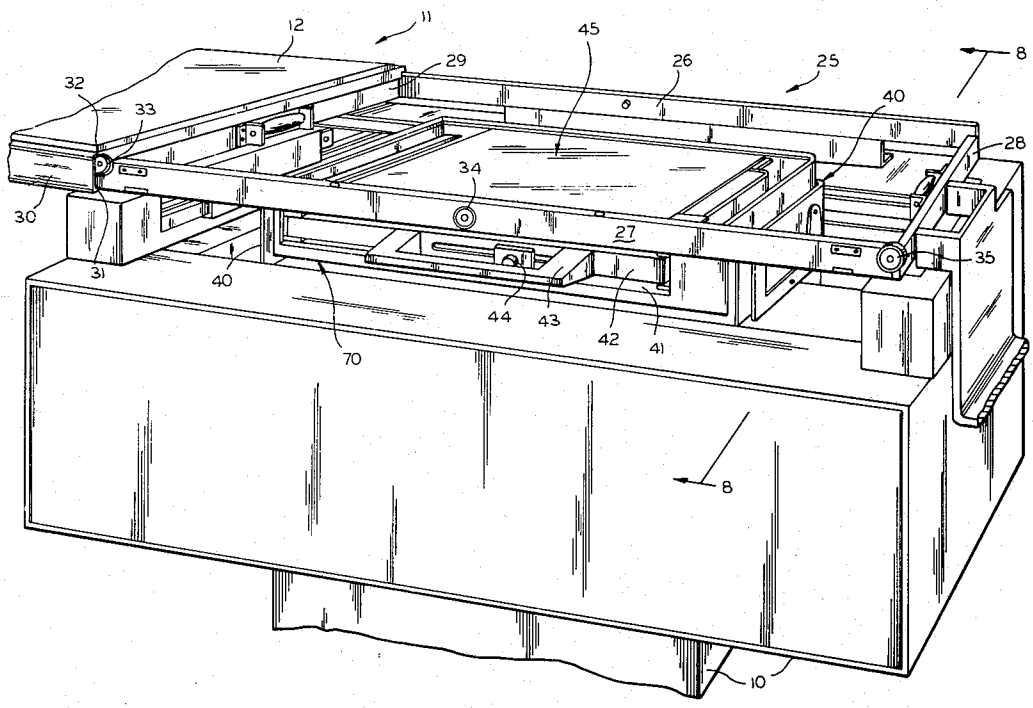
2,369,507	2/1945	West	250/445
2,680,199	6/1954	Abel	250/445
2,924,717	2/1960	Koerner	250/471
3,215,835	11/1965	Mueller	250/449
3,499,145	3/1970	Kok	250/444
3,555,276	1/1971	Endesfelder	250/444

Primary Examiner—Eli Lieberman
Assistant Examiner—D. C. Nelms
Attorney, Agent, or Firm—Ralph G. Hohenfeldt; Fred Wiviott

[57] **ABSTRACT**

Diagnostic quality of the image on an x-ray film in a cassette beneath a movable patient supporting top of an x-ray table is improved by providing Bucky and cassette tray elevating means in the Bucky carriage. When a radiograph is to be taken, the Bucky is elevated to close proximity with the bottom of the table top to thereby reduce the object to film distance. The Bucky is lowered to provide clearance under the table top frame for exchanging film cassettes.

7 Claims, 8 Drawing Figures



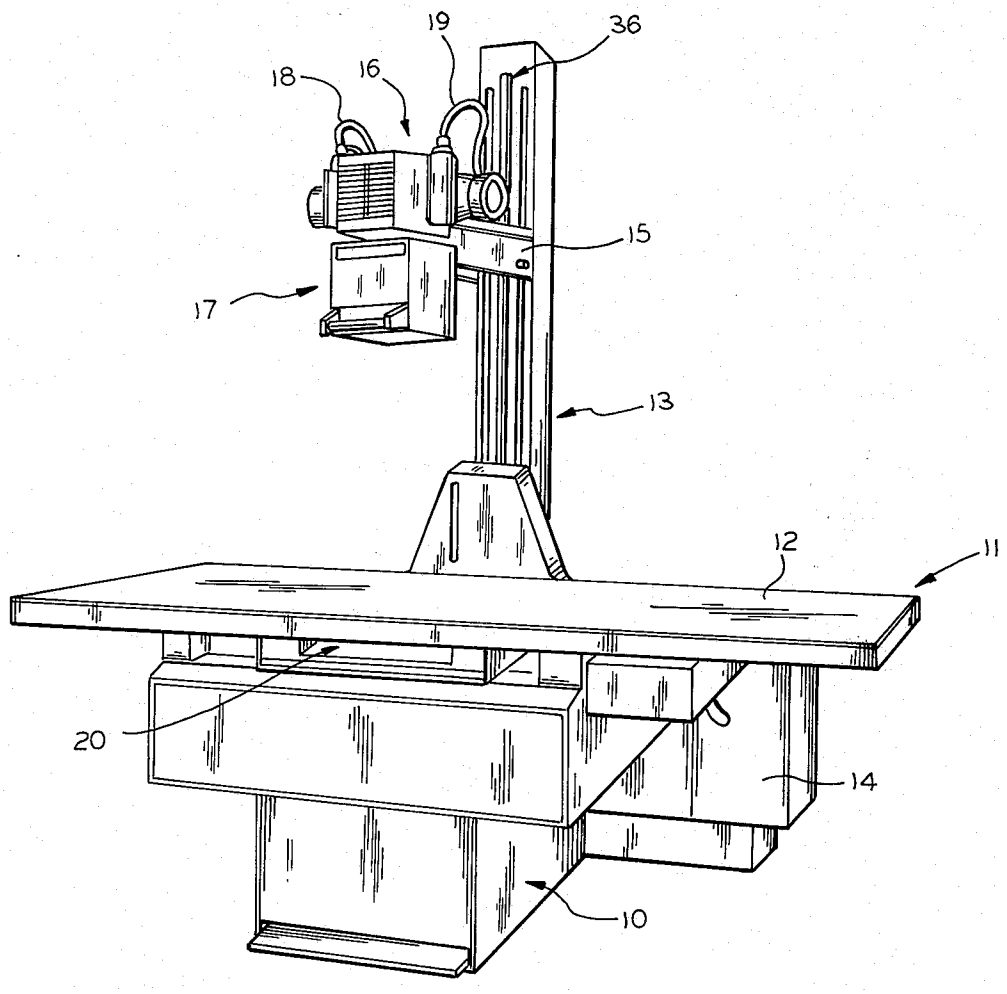


FIG.1

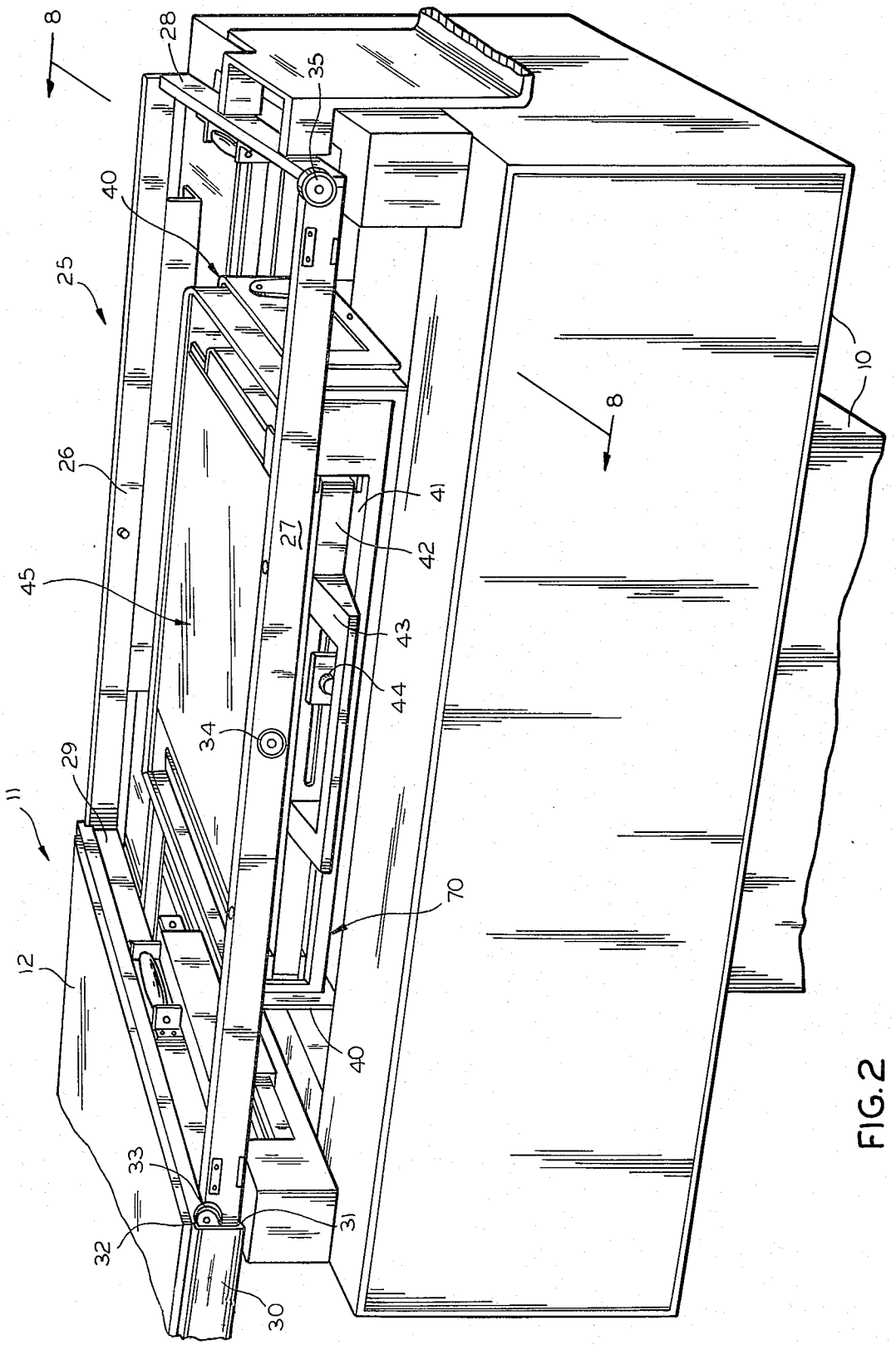


FIG.2

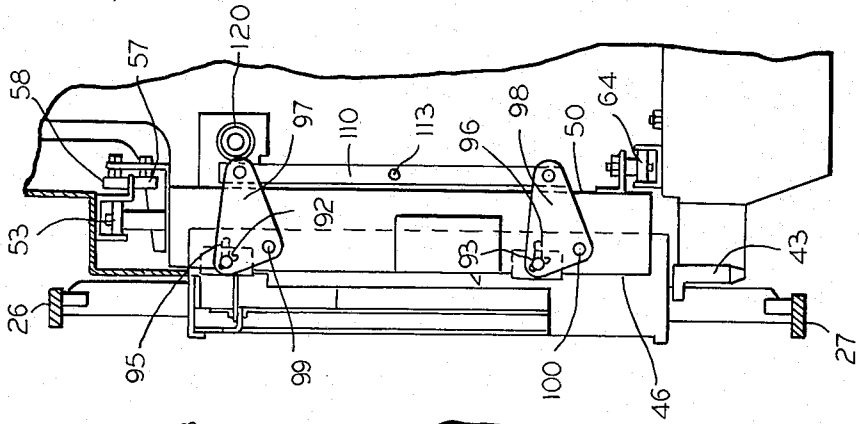

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FIG.4

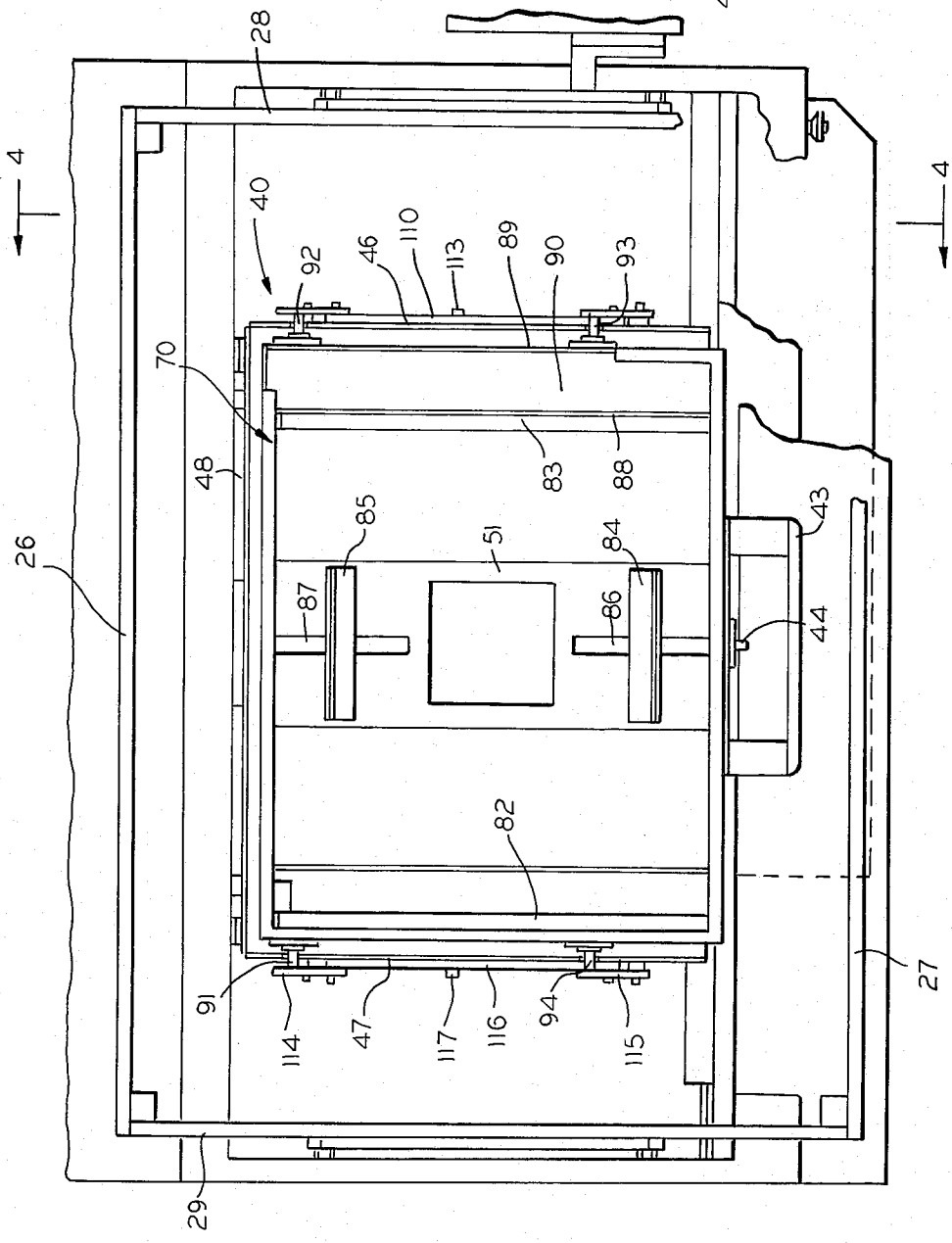

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FIG.3

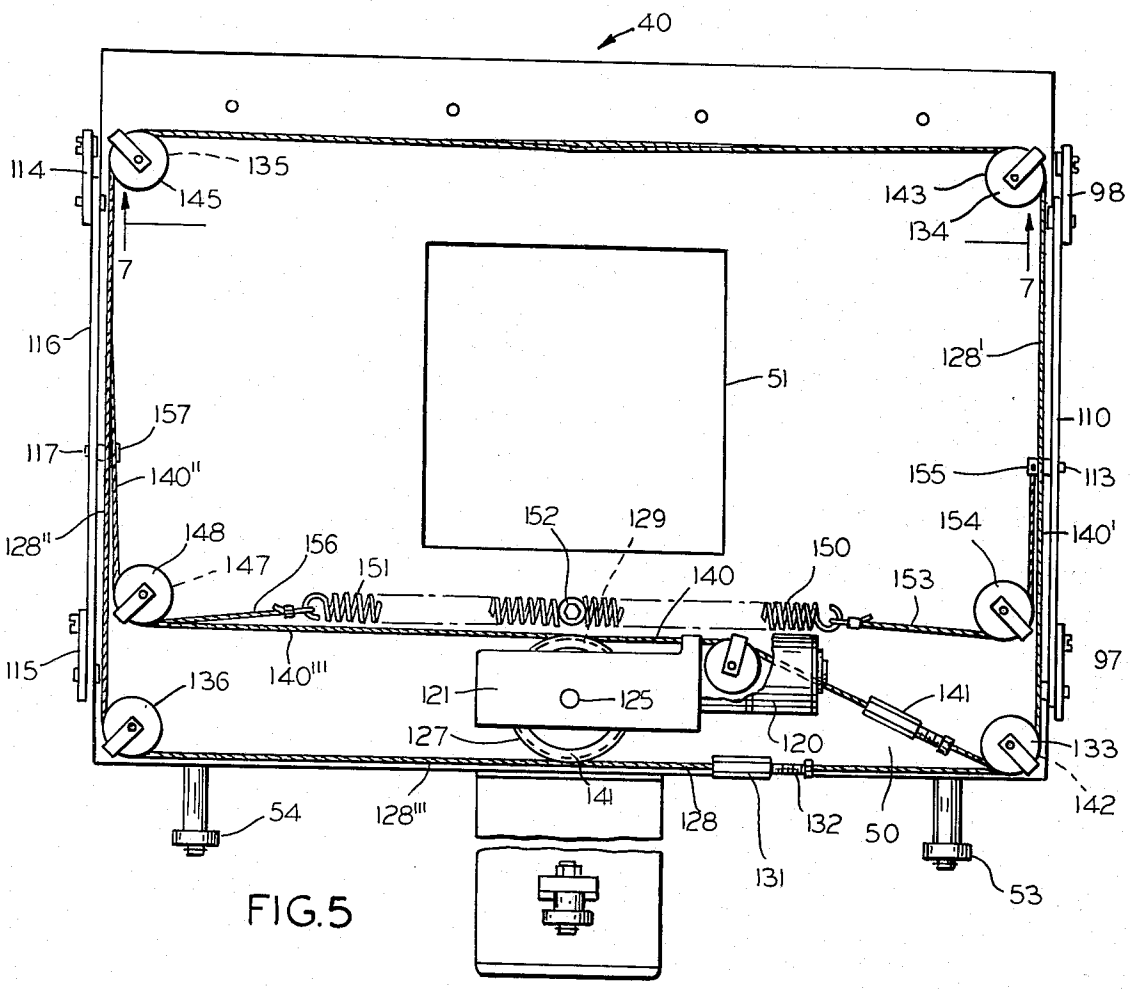


FIG.5

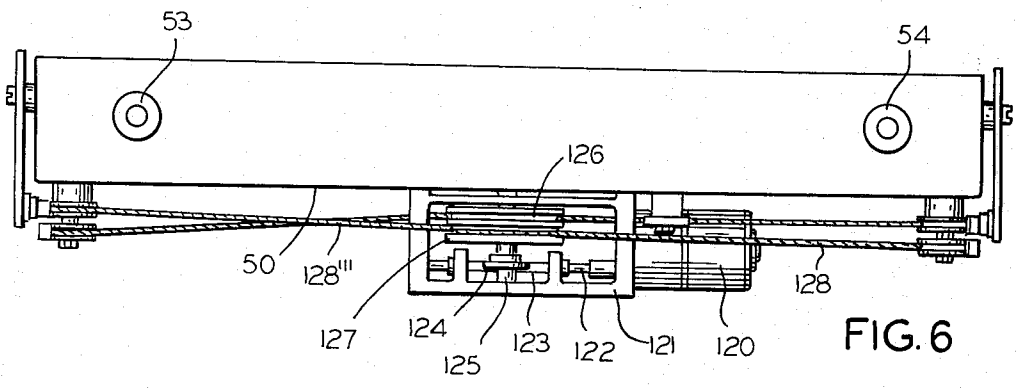


FIG.6

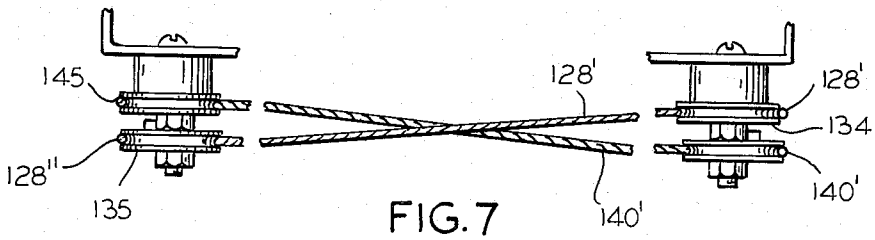


FIG.7

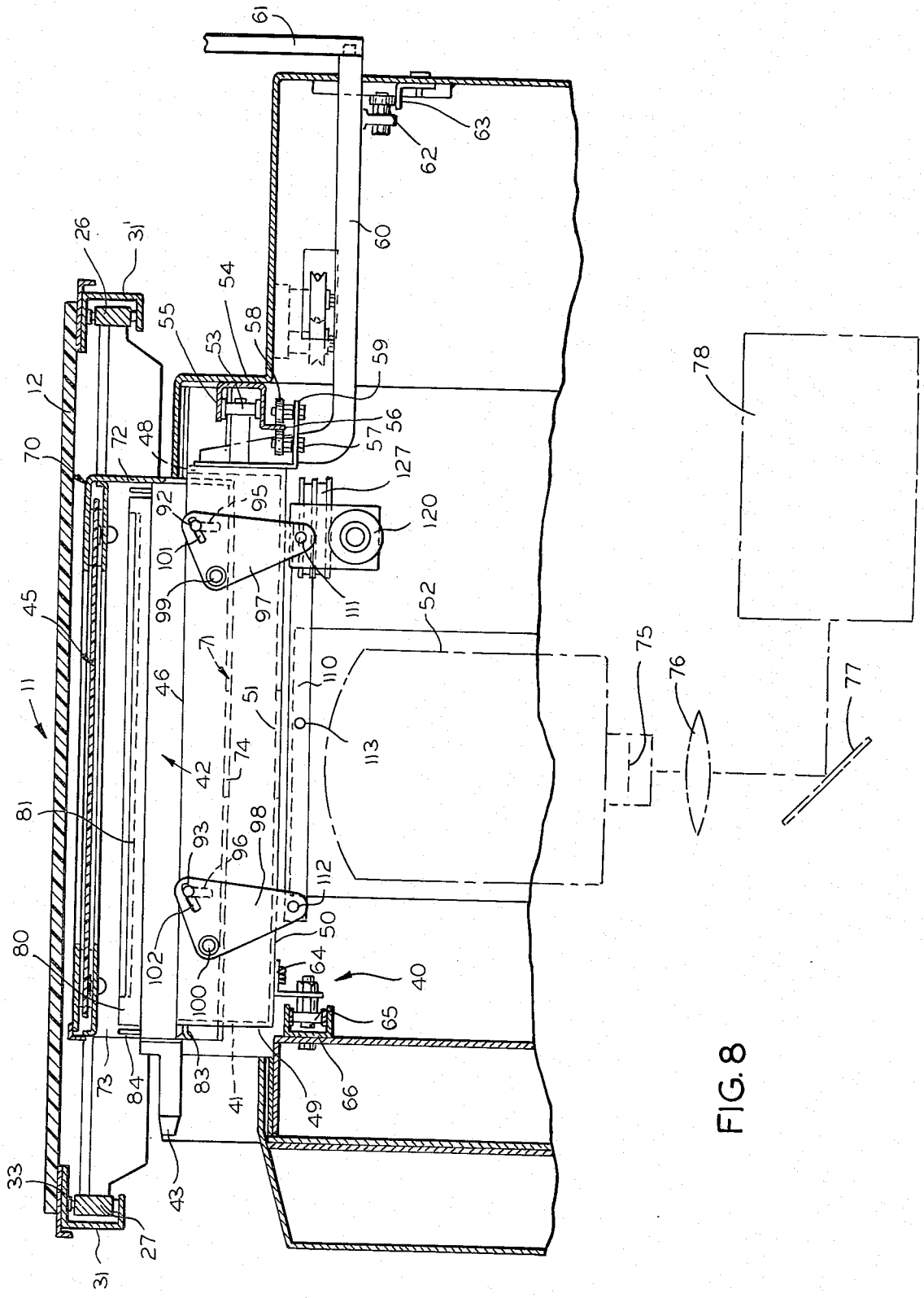

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FIG. 8

X-RAY TABLE WITH BUCKY ELEVATOR

BACKGROUND OF THE INVENTION

This invention relates to improvements in diagnostic x-ray tables and is particularly concerned with improving radiographic quality by reducing the distance between the anatomy of a patient supported on the x-ray table top and the film beneath the table top on which an x-ray image is recorded.

Diagnostic x-ray tables usually comprise an open metal frame which is covered with an x-ray transmissive panel or top for supporting a patient during x-ray examination. In one class of x-ray tables, the x-ray tube is supported over the table top and the radiographic film is contained in a cassette under the table top. The cassette is carried in a Bucky which is translatable longitudinally of the table top in the table body in a direction opposite of x-ray tube translation for tomographic procedures and so it may be positioned to coincide with the x-ray beam for other procedures.

As is known in the x-ray arts, the term Bucky designates a device for supporting a film cassette in a plane transverse to the x-ray beam which penetrates the patient and the x-ray table top. Usually the device will accept cassettes of various sizes. The device also usually incorporates a Potter-Bucky diaphragm or other grid in a plane between the x-ray table top and the cassette. The grid intercepts scattered radiation which does not originate at the x-ray tube focal spot and comprises alternate strips of x-ray opaque and x-ray permeable material. The grid is set into motion during radiographic exposures to diffuse the shadow lines which the opaque strips would otherwise cast. In some Bucky devices there is a sensor interposed between the grid and cassette for sensing the x-ray dosage received at the film. A tray which supports the film cassette and the components which support the grid above the tray are collectively called a Bucky herein. The Bucky is in a movable carriage in the present case but it may be supported independently in some cases.

It is often customary to support the top frame in a manner that permits it and the patient supported thereon to be moved longitudinally and laterally of the x-ray table body. Because this movement has to be executed without interference, it has been customary to mount the Bucky carriage at a level sufficiently far below the table top to permit the top frame to translate over it. As a result, it has been necessary for the plane of the film in the cassette to be on the order of three inches from the bottom of the table top in many existing tables.

As is well known, it is desirable to have the x-ray film plane as close as possible to the patient on the table top to minimize enlargement, and more importantly, unsharpness of the image on the radiographic film. Enlargement results from the x-ray beam radiating from a focal spot on the x-ray tube target and diverging conically so that the image of any increment of the patient's anatomy is displaced laterally and longitudinally on the film beneath the patient. The displacement and, hence, enlargement becomes greater as the distance between the film and patient is increased.

Unsharpness results from the x-ray tube focal spot having finite dimensions rather than being a point source. Thus, the edge of any increment of a patient's anatomy receives a ray from all areas of the focal spot which leads to the increment being imaged on the film

with an umbra and a penumbra that manifests as unsharpness. This effect can be reduced by positioning the x-ray film plane closer to the object and to the focal spot. As indicated, in conventional x-ray tables the object-to-film distance was fixed by design and was minimized only to the extent permitted by the need for having a table top frame clear the Bucky carriage when moving the table top bilaterally over the film cassette supported in the carriage.

One compromise that has been used to shorten the table top or object-to-film distance has been to depress the center part of the table top so the patient can be brought as close as possible to the film plane. However, a depression in the top has the disadvantage of making it difficult to transfer a seriously ill patient to and from the table top from a patient cart.

SUMMARY OF THE INVENTION

An object of the present invention is to enable minimizing the distance between the film plane under the table top and a patient supported on an x-ray table top.

A further object is to support the Bucky and film cassette on the Bucky carriage in such manner that the Bucky and film cassette can be elevated in between the top supporting frame members to proximity with the bottom of the table top.

A still further object is to provide for lowering the Bucky and film cassette to enable its withdrawal and replacement with convenience equal to that of prior table designs without elevatable Bucky and cassette trays.

How the foregoing and other more specific objects of the invention are achieved will appear in the ensuing more detailed description of a preferred embodiment of the invention taken in conjunction with the drawings.

In general terms, the improved x-ray table is characterized by having a Bucky carriage mounted for longitudinal movement within the table body under the table top. A vertically movable Bucky is mounted within the carriage. The Bucky has an independent tray for supporting the film cassette. Means are provided for elevating the Bucky when a radiograph is to be taken and for lowering the Bucky when the cassette tray is withdrawn for changing cassettes.

How the foregoing and other more specific objects of the invention are achieved will be evident in the ensuing description of an illustrative embodiment of the invention taken in conjunction with the drawings.

DESCRIPTION OF THE DRAWINGS

FIG. **1** is a perspective view of a diagnostic x-ray table in which the new film positioning system is used;

FIG. **2** is an enlarged perspective view of the x-ray table body with parts omitted and with the patient supporting top displaced so as to exhibit the top supporting frame and Bucky carriage;

FIG. **3** is a plan view of the Bucky carriage and cassette tray with the overlying Bucky grid removed;

FIG. **4** is a fragmentary vertical and lateral sectional view taken on a line corresponding with **4—4** in FIG. **3**;

FIG. **5** is a bottom view of the Bucky carriage showing the drive mechanism for raising and lowering the film tray and grid;

FIG. **6** is an upright rear elevational view of the carriage;

FIG. 7 is a view of the elevating mechanism drive cables taken on a line corresponding with 7—7 in FIG. 5; and

FIG. 8 is a partial transverse section taken through the table assembly to show the carriage and associated parts in side elevation.

DESCRIPTION OF A PREFERRED EMBODIMENT

FIG. 1 depicts a typical diagnostic x-ray table in which the new Bucky raising and lowering device may be used. This is a nontilting table but the device may also be used in the tilting type. Moreover, although the herein described x-ray table includes an integral overhead x-ray tube support means it will be understood that the new Bucky elevating system may be used in an x-ray table that has an independently supported x-ray tube. The illustrated table comprises a body **10** on which there is a patient supporting top assembly **11**. The top assembly essentially comprises a rectangular frame, which will be described later, on which there is a planar x-ray transmissive panel **12** for supporting the patient. Behind the table is a column **13** which is mounted for translation longitudinally of the table top and for rotation about a vertical axis. The mounting which permits rotation of column **13** and the tracks which permit its translation are not shown since they may be conventional. The tracks may be located in the rear part **14** of housing **10**.

A vertically movable arm **15** extends laterally over the table top **11**. An x-ray tube assembly **16** is mounted on the free end of the arm and a conventional x-ray beam collimator **17** is supported from the tube assembly. The x-ray tube is energized by electric cables **18** and **19**. The tube, not shown in detail, is conventional in that it has a high energy electron beam focused on a target. X-rays radiate from the focal spot and are projected in a beam through collimator **17** toward table top **12** and through any object or patient supported thereon. In this case the x-ray image is recorded on film which is in a cassette supported in a Bucky in a carriage underneath the table top in the region identified by the numeral **20**. The Bucky and cassette tray and affiliated parts will be described in detail hereinafter.

The x-ray table top assembly **11** is mounted for limited longitudinal and lateral translation with respect to table body **10**. FIG. 2 shows more details of the table top assembly **11** and other components within body **10**. FIG. 2 shows a table top assembly supporting carriage identified generally by the reference numeral **25** and comprised of four bar members **26, 27, 28** and **29** which are joined at their corners by any suitable means to form a rectangle. Top carriage **25** is adapted for translating laterally of body **10** by suitable roller supports, not visible in FIG. 2, which are of a known type and can be devised by a skilled mechanical design. The table top assembly **11** is shown fragmentarily with its leading end about to be assembled on laterally movable carriage **25**. Top assembly **11** is adapted for translating longitudinally on carriage **25**. For this purpose, the top assembly **11** has a longitudinally extending channel **30**, comprising part of the table top supporting frame, which has inwardly extending flanges **31** and **32** which serve as a track for guiding the table top on laterally movable carriage **25**. The rear of top assembly **11** has a track corresponding with track **30** although it is not visible in FIG. 2. Carriage **25**, as can be seen on front bar member **27**, has rollers such as **33, 34** and **35**. The top flange **32** of channel **30** bears on rollers **33** and **35** which extend above the top plane of bar **27**. The bottom flange **31** of channel **30** is engaged by center roller **34** such that there is no vertical free play between top assembly **11** and carriage **25**. Of course, when the assembly is complete, top **11** is substantially coextensive with rectangular carriage **25** as it appears in FIG. 1 but there are stops, not shown, for limiting the amount of longitudinal travel of the top **11** with respect to carriage **25** and also stops, not shown, for limiting lateral travel of table top carriage **25**.

In FIG. 2, the Bucky carriage, which is designed in accordance with the invention to enable shortening the distance between the radiographic film beneath table top panel **12** and a patient supported thereon, is designated generally by the reference numeral **40**. By means which will be described in detail hereinafter, Bucky carriage **40** is adapted for moving to a limited extent longitudinally within the table body. For instance, by means which are not shown in detail, the table is adapted for conducting tomography which is an x-ray procedure involving moving Bucky carriage **40** and film longitudinally in one direction underneath table top **12** while the x-ray tube **16** is moved in an opposite direction above the table top. The motion above the table top is obtained by translating column **13** which in combination with a coupling bar **36** causes tube arm **15** to rotate on its horizontal axis. This conventional tomographic coupling bar **36** couples the Bucky carriage **40** in effect to the tube arm **15**. Longitudinal driving of column **13** brings about the opposite motions of the film and Bucky carriage **40** and x-ray tube **16**. As is well known, in tomographic procedures, the fulcrum or rotational axis of the coupling bar is positioned at the same height as the required object plane so that all planes above and below the plane containing the rotational axis are blurred on the film while the plane containing the rotational axis remains in focus and produces a relatively sharp image on the film.

Attention is now invited to FIGS. **3, 4** and **8** for an explanation of how the Bucky carriage **40** is constructed and mounted within the x-ray table body. In these figures, it is evident that the Bucky carriage **40** comprises an open top box-like member having upstanding sides **46** and **47**, an upstanding rear **48** and a front **49** with a front opening **41** for admitting and withdrawing a film tray **42** from the front of the x-ray table for exchanging cassettes therein. The bottom of carriage **40** is identified by the number **50** and is particularly evident in FIG. **8**. The bottom **50** has a central opening **51**, see FIG. **3**, which, when there is no film in the carriage, permits an x-ray image to be intercepted on the sensitive surface of an image amplifier **52** that is shown in phantom in FIG. **8**.

The manner in which Bucky carriage **40** is mounted for longitudinal movement within the x-ray table will now be described. Refer to FIG. **8** where an end view of the Bucky carriage **40** taken in a longitudinal direction may be seen. At the rear, the Bucky carriage **40** is supported on rollers such as **53** which run on a horizontal axis between the flanges of a stationary longitudinally extending channel **54**. The channel is provided with some hardened steel strips **55** for the rollers **53** to run on without wearing the track and to provide frictionless free-rolling motion. A lip **56** extending downwardly from channel **54** is engaged between another pair of rollers **57** and **58** which are mounted for rota-

tion about vertical axis on a bracket **59** which is fastened to Bucky carriage **40.** Extending rearwardly from the back wall **48** of Bucky carriage **40** is an arm **60** on which a force is applied for translating the Bucky carriage longitudinally within the table. This may be done with the bar **61** which is shown fragmentarily in FIG. **8.** Arm **60** and, hence, Bucky carriage **40** is further guided by rollers **62** running on a track **63** which is right angular in cross section. The front end of Bucky carriage **40** has a bracket **64** on its bottom to support the shaft of a roller **65** which cooperates with a stationary channel member **66** constituting a track. There may be several such front rollers. Thus, it is evident that Bucky carriage **40** may translate bidirectionally longitudinally of and under the table top under the influence of a longitudinal force applied to arm **60.**

In FIG. **8** one may see that carriage **40** contains a Bucky **70.** The bottom **71** of the Bucky **70** is shown in hidden lines in FIG. **8** and the substantially imperforate backwall thereof is marked **72.** The front wall of the Bucky **70** is open in the region **73.** Bucky **70** supports the reciprocable Bucky grid **45** which was briefly described hereinbefore. The grid oscillating mechanism is not shown but may be a known type. This grid, being part of the Bucky, raises and lowers with the Bucky so as to advance and recede with respect to the bottom surface of the patient supporting top **12,** thereby maintaining constant spacing between the grid **45** and cassette **80.** In FIG. **8** the Bucky is shown in elevated position in which case it extends upwardly between the channel tracks or side frame members **31** and **31'** on which the table top **12** is supported. There is sufficient clearance at the front and rear ends, the right ends in FIG. **8,** of the Bucky **70** to allow table top assembly **11** to be shifted manually laterally of the table body.

The bottom **71** of the Bucky **70** has a central hole **74** which aligns with hole **51** in the bottom of the Bucky carriage so that a limited area of the subject being radiographed can be intercepted on the image amplifier **52.** Image amplifier **52** may be a conventional type for converting an x-ray image to an optical image. The optical image appears on a phosphor **75** and this image may be viewed through an objective lens **76** and a mirror **77** which directs the image to a television camera **78.** A monitor, not shown, is used to display the television image produced by camera **78.**

In FIG. **8** one may see that a manually movable cassette tray **42** extends into the Bucky **70** through its open front region **73.** Tray **42** supports a film cassette **80** which is outlined in FIG. **8.** The plane of the radiographic film within the cassette is shown as a hidden dashed line **81.** In a commercial embodiment, the film plane **81** is only about 1.2 inches from the top surface of patient supporting panel **12** when the Bucky **70** is elevated in Bucky carriage **40.** This dimension may be increased if an optional x-ray sensing device, not shown, is installed between Bucky grid **45,** which is at a fixed height within the Bucky **70,** and the cassette tray **42.** When the Bucky **70** is lowered, tray **42** and cassette **80** supported thereby are lowered with it to facilitate withdrawal of the film tray **42** from under table top frame channel **30** by gripping handle **43** and drawing the tray toward the front of the table. In this manner, cassettes may be interchanged in the table.

In FIG. **3,** one may see that there are longitudinally spaced apart laterally extending channel tracks **82** and **83** for supporting cassette tray **42** in Bucky **70.** The front ends of tracks **82** and **83** are visible in FIG. **2.** On cassette tray **42** are clamping members **84** and **85** which clamp cassette **80** in approximately center position and are linked together by means which are not shown. The clamping members move toward and away from each other in respect to guide slots **86** and **87.** Movement of the clamping members **84** and **85** is effected by longitudinal shifting of knob **44.** The mechanism for driving the clamping members is conventional and is omitted for the sake of clarity as indicated earlier. Tray **42** has a partition wall **88,** see FIG. **3,** for defining with end wall **89** a compartment **90** for cables and other electrical components, not shown.

A significant feature of the structure is that Bucky **70** and tray **42** thereon can be raised and lowered within Bucky carriage **40** so as to place the film plane **81** as close as possible to table top **12** prior to radiography. In this design the Bucky constitutes a support means for the laterally movable cassette tray means, a cassette thereon, and the grid. The mechanism for raising and lowering the Bucky **70** and tray **42** to accomplish this purpose will now be described.

As can be seen in FIGS. **3, 4** and **8,** there are four lift pins **91** to **94** projecting from the side walls of elevatable Bucky **70.** Pins **92** and **93** extend through straight vertical slots **95** and **96,** respectively, in the side wall **46** of cassette carriage **40.** Pins **92** and **93** are engaged by bell cranks **97** and **98,** respectively. Bell crank **97** pivots on a pin **99** which is mounted on the outside of side wall **46** of Bucky carriage **40.** Bell crank **98** is similarly mounted for pivoting on a pin **100.** Bell cranks **97** and **98** are provided with slotted holes **101** and **102,** respectively, by means of which the bell cranks are engaged with lift pins **92** and **93** and, hence, Bucky **70.** Counterclockwise rotation of bell cranks **97** and **98** will restore Bucky **70** to its uppermost position in which it is depicted in FIG. **8.**

The bell cranks **97** and **98** on this end of the Bucky carriage **40** are connected together by a link **110.** Opposite ends of link **110** are pivotally connected at **111** and **112** to bell cranks **97** and **98,** respectively. It is evident from inspection of FIG. **8** in particular that when link **110** is shifted to the left from the position in which it is shown, bell cranks **97** and **98** will rock clockwise jointly to lower Bucky **70** in carriage **40.** Pins **92** and **93** travel in slots **95** and **96.** When link **110** is shifted to the right again to the position in which it is shown in FIG. **8,** the bell cranks will rock counterclockwise and elevate Bucky **70** again. The force for shifting link **110** lengthwise is applied by means of a centrally located pin **113.**

The bell crank and linkage construction at the opposite side of the Bucky carriage **40** is similar and symmetrical to that described in the preceding paragraph. In FIG. **3** it is evident that lift pins **91** and **94** on the opposite end cooperate with bell cranks **114** and **115** which are connected together by a link **116.** The link **116** also has a pin **117** for shifting it lengthwise.

A mechanism for shifting links **110** and **116** to raise and lower Bucky **70** will now be described primarily in reference to FIGS. **5–7.** FIG. **5** shows an inverted or bottom view of Bucky carriage **40.** When properly upright, the rollers **53** and **54** on which the Bucky carriage are supported would be to the rear of the table.

In this example, links **110** and **116** are shifted and Bucky **70** is thereby raised and lowered by a motor **120** mounted on the bottom of Bucky carriage **40.** Motor

120 is supported on a bracket 121 which is fastened to the bottom 50 of the Bucky carriage. FIG. 6 is an elevation view of the Bucky carriage as it would appear from the rear when it is installed in its normal upright position. Motor 120 has a shaft 122 on which there is a worm gear 123 that engages a worm wheel 124 which is fixed on a shaft 125. Shaft 125 has two axially adjacent cable drums fixed 126 and 127 on it. The lowermost cable drum 127 has the end of a cable 128 running half-way around it. Cable 128 has its end fastened approximately at the point marked 129 inside of the drum. Cable 128 may be considered continuous from its starting point on drum 127 and running to the right and back around the bottom of the carriage to return as an end 128'''. End 128''' also makes a half-turn around drum 127 and is fastened at the same point 129 at which the end of cable portion 128 is fastened. A turnbuckle type device including an internally threaded body 131 and cooperating screw 132 can be turned to establish proper tension in the cable run. It is evident from FIGS. 5 and 7 that cable section 128 runs across the foremost or rear portion of carriage 25 and makes a bend around a corner mounted sheave 133 whereupon it runs along the side of the carriage and is marked 128'. It then passes around another corner mounted sheave 134 whereupon it crosses over another cable, to be described, and around a corner mounted sheave 135 which is beneath another sheave 145 on a common axis. The crossover is exhibited in FIG. 7. After passing around sheave 135, the continuation of the cable is marked 128'' which then goes around the sheave 136. These sheaves are also on a common axis of rotation. After passing around sheave 136, the continuation of the cable is marked 128''' where it continues to its anchor point 129 on drum pulley 127. The side section 128'' is fastened to pin 117 which is carried by bell crank operating link 116. One may see in FIG. 5 that if drum pulley 127 is rotated counterclockwise, cable section 128 will pay out and section 128''' will be taken in and placed in tension so as to shift link 116 at the left forward or toward the observer.

The other drum pulley 126 also has the end of a separate cable section 140 wrapped half way around it and anchored at approximately the point 141. In FIG. 5, the section of cable 140 extending to the right has a turnbuckle 141 installed in it for maintaining proper cable tension. Cable 140 section passes around a sheave 142 which is underneath sheave 133 and on the same axis, and the continuation of cable 140 is marked 140'. The cable section 140' is fastened to pin 113 in bell crank operating link 110 on the right side of the carriage as it appears in FIG. 5. Section 140' continues and passes around a sheave 143 which is on the same axis of rotation of sheave 134. Cable 140' then crosses over cable 128' as is evident from FIG. 7. Cable 140' continues around sheave 145 after which the ensuing cable section is marked 140''. This section is not fastened to pin 117 but merely passes it. Cable section 140'' then passes around the uppermost sheave 148 in a pair of sheaves on a common axis which includes a sheave 147. After passing around sheave 148, cable 140 is marked 140''' whereupon it makes its terminal half turn around drum pulley 126 and is anchored at point 141. It will be evident from inspection of FIG. 5 that when motor 120 drives drum pulley 126 counterclockwise along with pulley 127, cable section 140 will be placed in tension and cable will pay out in the direction of section 140'''. Because cable section 140' is fastened to pin 113 of link 110, the latter link will be urged toward the observer simultaneously with link 117. This translational movement of link 110 will rock bell cranks 97 and 98 in unison with bell cranks 114 and 115 to thereby cause Bucky 70 to raise in the cassette carriage 40. The double cable arrangment involving cables 128 and 140 assures that the Bucky 70 will be raised and lowered steadily. Further steadiness and equilibrium of the Bucky 70 is assured by use of a spring balancing system including a pair of springs 150 and 151 which have their corresponding inner ends fastened to a fixed stud 152. The free end of spring 150 is connected to a cable 153 which runs around a sheave 154 and attaches at point 155 to pin 113 in operating link 110. The other spring 151 is attached to a tension cable 156 and it runs around sheave 147 whereupon it is attached at 157 to pin 117 in operating link 116. It will be evident that springs 150 and 151 tend to keep the system in equilibrium and balance and aid the motor in lifting the Bucky 70 within Bucky carriage 40. They also tend to absorb shock when the Bucky 70 is lowered.

Although the new concept of enabling elevation of Bucky in a Bucky carriage to get the film closer to the object being radiographed has been exemplified in a system using a motor to raise and lower the Bucky, it will be appreciated by those skilled in the art that manual means can be employed as well. For instance, it is contemplated in some embodiments to provide a manually accessible mechanism including a lever, not shown, for actuating bell crank operating links 110 and 116. Now that the concept of raising the Bucky film prior to radiography has been suggested, it should be within the purview of a skilled designer to produce other mechanisms for raising and lowering the Bucky and film. Thus, although a preferred embodiment of the invention has been described in detail, such description should be considered illustrative rather than limiting for the invention may be variously embodied and should be limited only by interpretation of the claims which follow.

We claim:

1. In diagnostic x-ray apparatus including an x-ray permeable table top arranged for cooperating with an x-ray tube which is positionable on one side of said top for accommodating a diagnostic subject between said tube and table top, means supporting said table top for bidirectional lateral and longitudinal movements in a plane to thereby enable a subject on said top to be positioned selectively, said supporting means including frame means extending away from said top and defining a space that is closed about its perimeter and has an open bottom, said frame means supporting said top on a side remote from the patient supporting surface thereof, a carriage means mounted for moving longitudinally relative to said table top beneath it and independently thereof, the improvement comprising:

a. support means on said carriage means, said support means being selectively movable between a first position remote from said table top and a second position closer to said table top,

b. cassette tray means mounted on said support means for being moved laterally to enable withdrawal thereof for exchanging film cassettes, said tray means being constructed and arranged to support a film cassette, said tray means supporting a

film cassette within said space defined by said frame means when said support means is in said second position and said tray means supporting said cassette below said frame means and said space when said support means is in said first position,

c. withdrawal of said cassette tray means being interfered with by said table top frame means when said support means is in its second position and being clear of said frame means when in its first position, and

d. selectively operable means for moving said support means between its first and second positions relative to said carriage means.

2. The invention set forth in claim **1** including:

a. grid means mounted on said support means in substantial parallelism with said tray means, said grid means being interposed between said cassette tray means and said table top and being movable with said support means jointly with said cassette tray means toward and away from said table top.

3. The invention set forth in claim **1** wherein:

a. said selectively operable means includes link means mounted pivotally on said carriage means and engaged with said support means, and

b. means for actuating said link means to pivot in selectively opposite directions to thereby effect said position changes of said support means.

4. The invention set forth in claim **3** including:

a. motor means mounted on said carriage means, and

b. means for coupling said motor to said actuating means.

5. The invention set forth in claim **1** including:

a. longitudinally spaced apart pairs of elements each of which are pivotally mounted to said carriage means and the elements in a pair being spaced laterally from each other,

b. means for engaging each of said elements with said support means,

c. link means connecting said elements in each pair, respectively, for pivoting jointly, and

d. selectively operable actuating means operatively connected with said respective link means to translate said link means and thereby pivot said elements and move said support means.

6. The invention set forth in claim **3** wherein said actuating means comprises:

a. motor means mounted on said carriage means,

b. drum means rotatable in selectively opposite directions by said motor means,

c. sets of a plurality of sheave means supported on said carriage means,

d. a first flexible element having its opposed ends attached to said drum means and running on one set of said sheave means, said first flexible element being engaged intermediate its ends with one of said link means, and

e. a second flexible element having its opposite ends attached to another of said drum means and running on another set of said sheave means, said second flexible element being engaged intermediate its ends with the other of said link means.

7. In diagnostic x-ray apparatus including an x-ray permeable table top arranged for cooperating with an x-ray tube which is positionable on one side of said top for accommodating a diagnostic subject between said tube and table top, means supporting said table top for bidirectional lateral and longitudinal movements in a plane to thereby enable a subject on said top to be positioned selectively, said supporting means including frame means supporting said top and defining a space on a side of said table top remote from the patient supporting surface thereof, a carriage means mounted for moving longitudinally relative to said table top beneath it and independently thereof, the improvement comprising:

a. support means on said carriage means, said support means including a rear member, longitudinally spaced apart side members and a front member, said front member having an opening therein,

b. longitudinally spaced apart track means extending from said opening in a lateral direction between said side members,

c. cassette tray means including cassette clamping means for supporting a film cassette, said tray means being supported on said track means and being withdrawable through said opening to permit exchanging film cassettes clear of said table top, and

d. means for selectively moving said support means between raised and lowered positions in respect to said carriage means, withdrawal of said tray means being prevented by said table top frame means interfering with said tray means when it is raised with said support means but said cassette tray means and a film cassette thereon being closer to said table top when in raised position for improving radiographic quality, said tray means being withdrawable without interference when said support means is in its lower position,

e. radiographic grid support means supported from said support means between said cassette tray means and said table top, said grid support means being constructed and arranged to support a grid in substantial parallelism with said tray means, and

f. said grid means support means being movable with said support means to maintain a constant distance between said tray means and grid means when said support means is in either its raised or lowered position.

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