

[54] MEDICAL EXAMINATION TABLE

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[22] Filed: Nov. 8, 1973

[21] Appl. No.: 414,088

Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 274,635, July 24, 1972, abandoned.

[52] U.S. Cl. .... 269/323, 128/134, 269/328

[51] Int. Cl. .... A61g 13/00

[58] Field of Search ..... 128/134; 269/60, 322, 323, 269/324, 325, 326, 328

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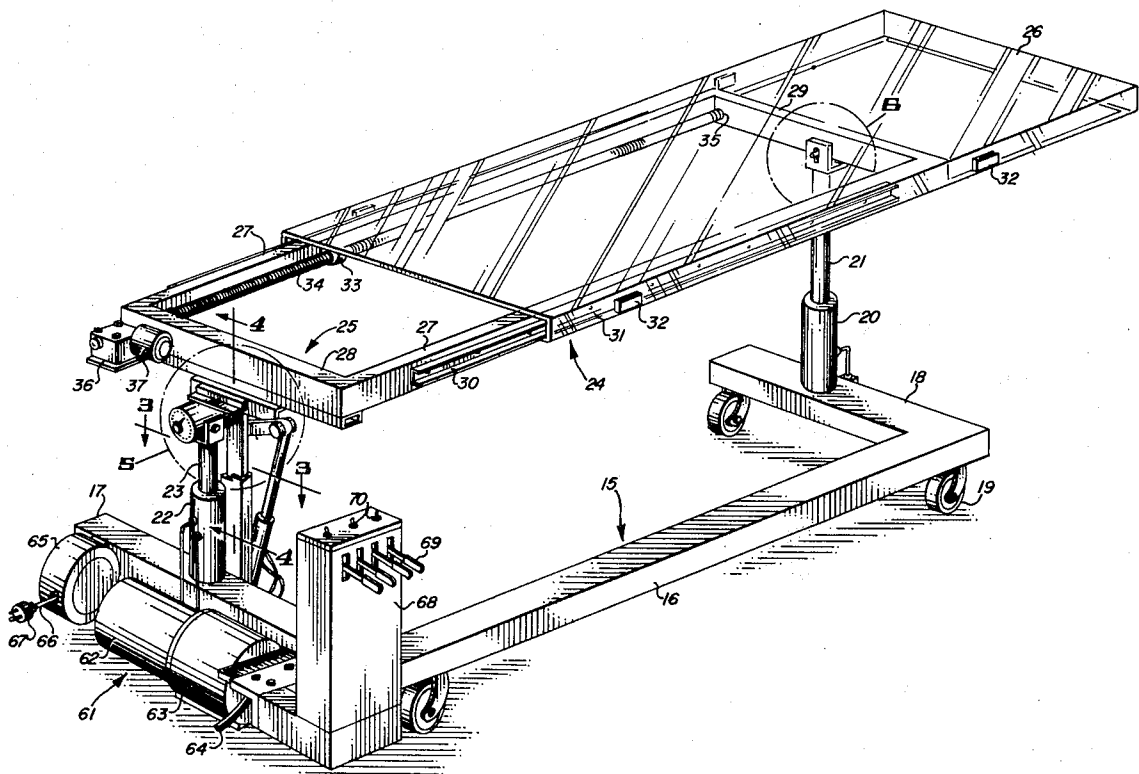
Assistant Examiner—Mark S. Bicks

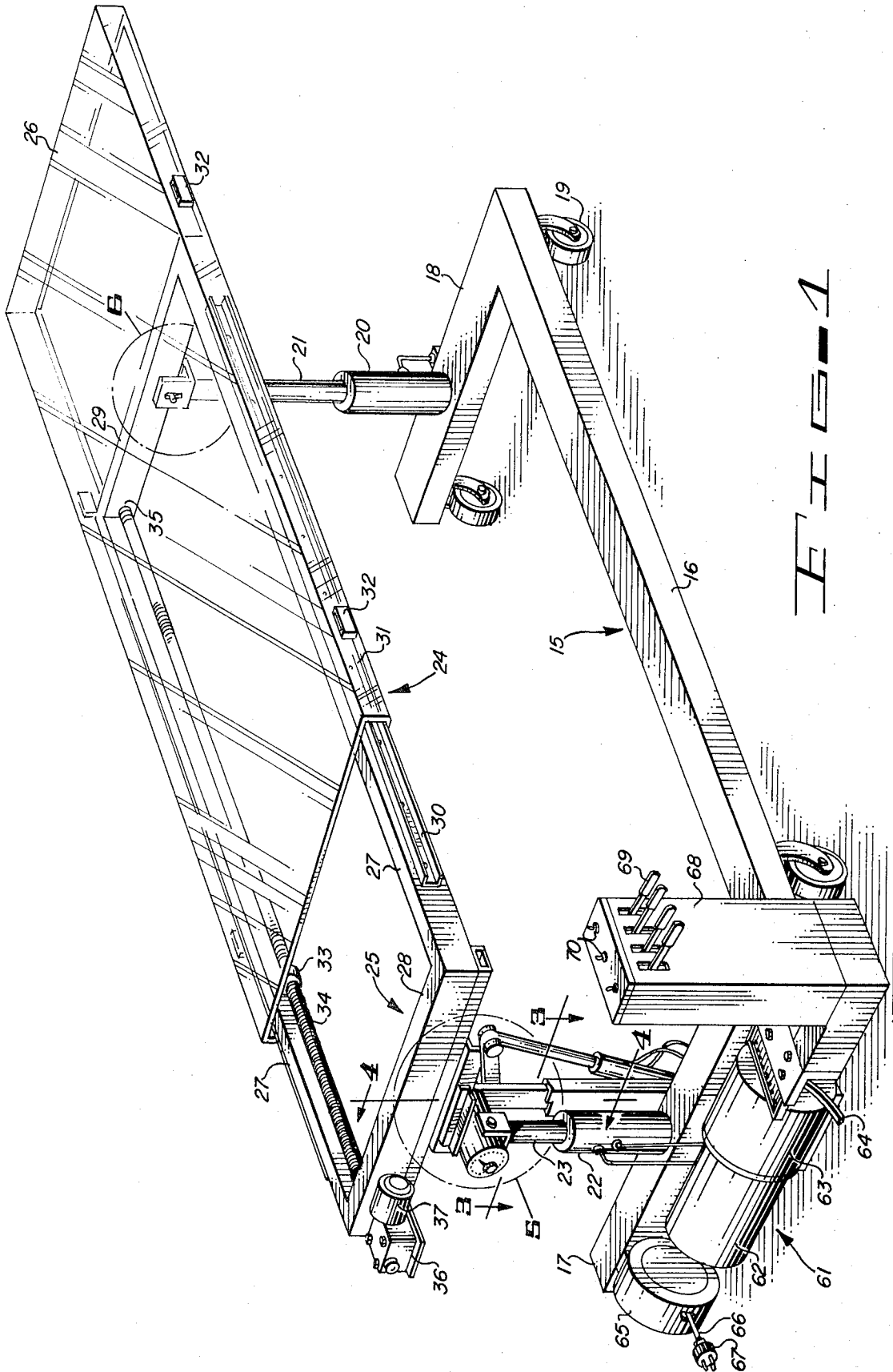
Attorney, Agent, or Firm—John A. Robertson

[57] ABSTRACT

A medical examination table intended primarily for X-ray examinations, and comprising a movable base and a table proper movable vertically relative thereto. The table proper comprises a main frame, and an extensible section. The main frame is supported at each end from the base by a hydraulically actuated piston and is tiltable on a longitudinal axis under the influence of an hydraulically actuated piston. A screw stem provides adjustment for the extensible section relative to the main frame and is actuated by an electric motor. An hydraulic system is provided for the hydraulic cylinders and included therein is a power cylinder in which hydraulic pressure is generated by an electric motor. An electric system is also provided which includes the motors aforesaid. A control console includes operating levers for determining the flow of the hydraulic medium to the hydraulic cylinders and switching members for the electric circuit.

10 Claims, 12 Drawing Figures





F I S S A

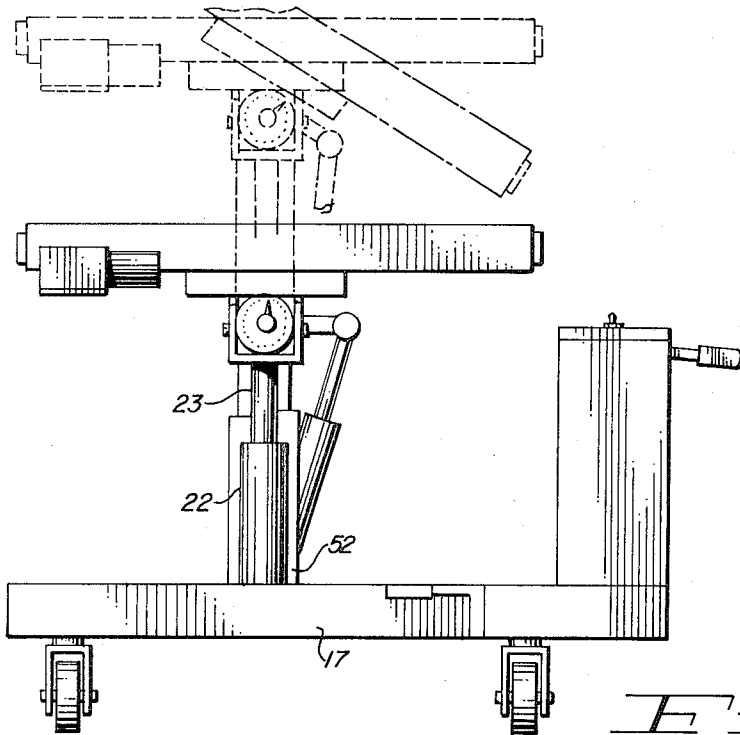


FIG. 2

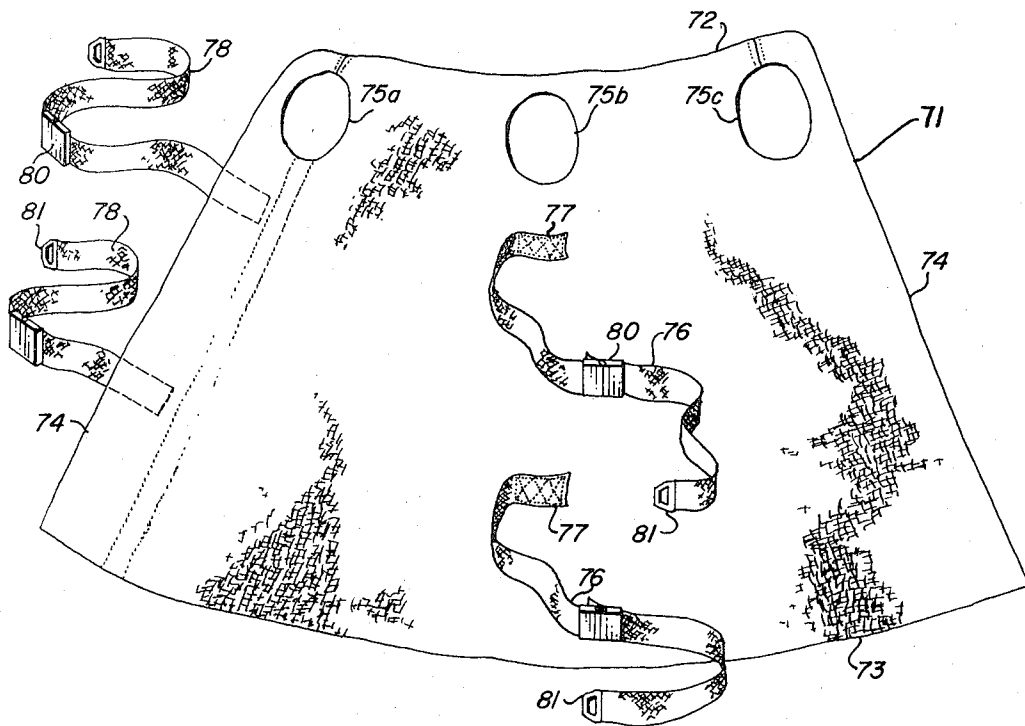


FIG. 7

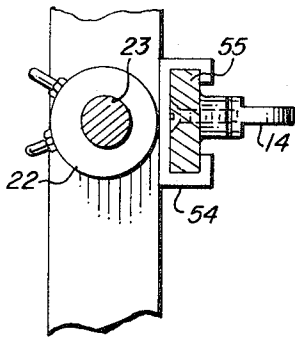


FIG. 3

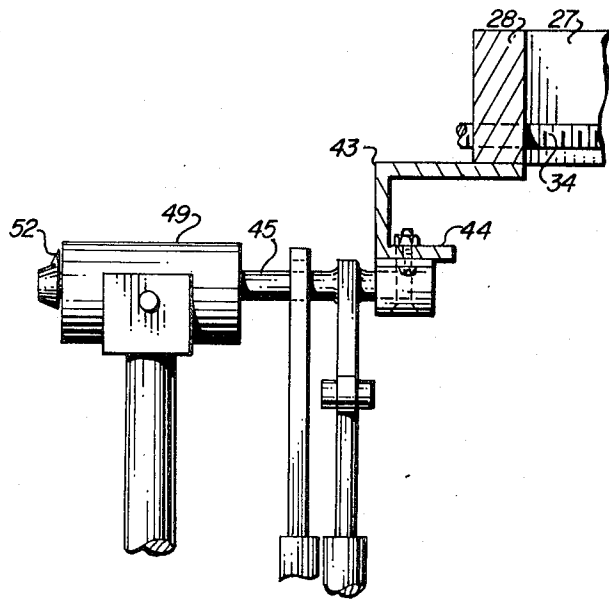


FIG. 4

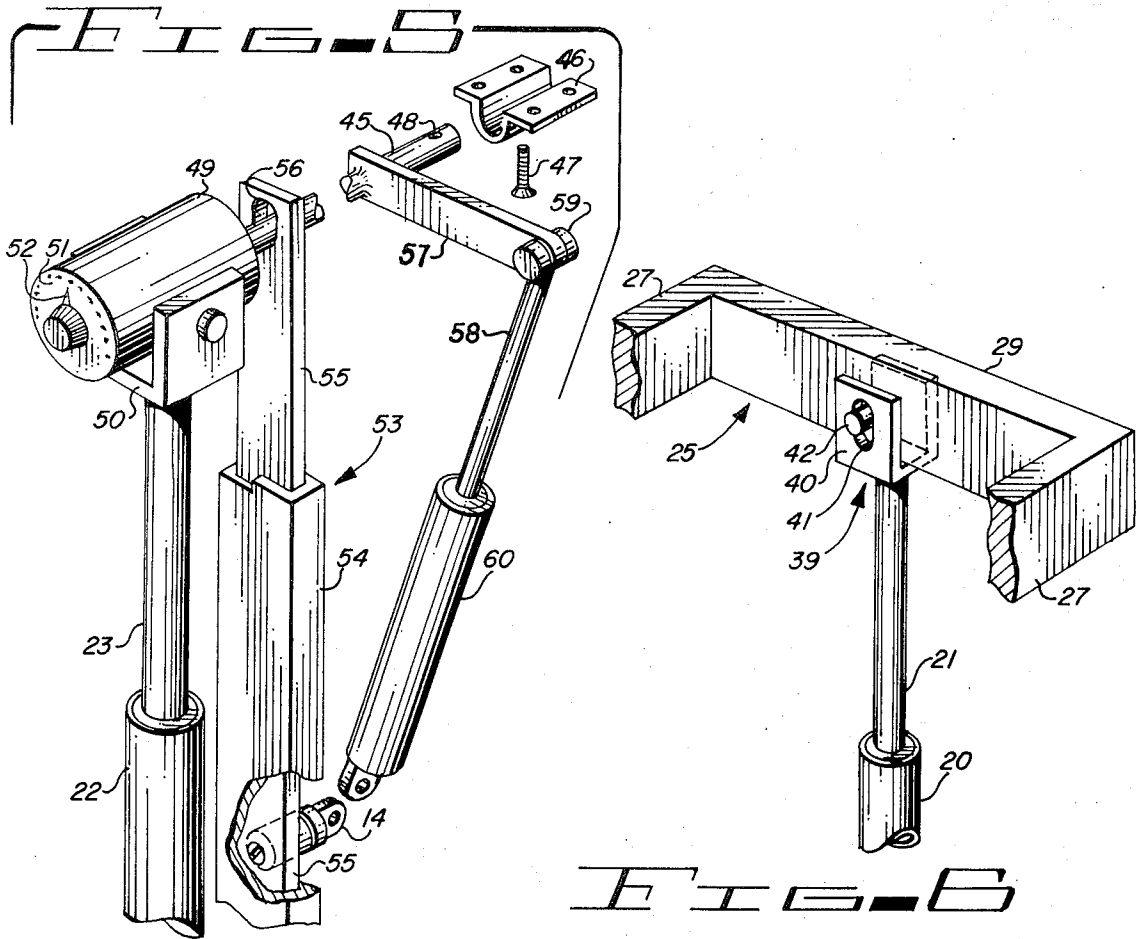


FIG. 5

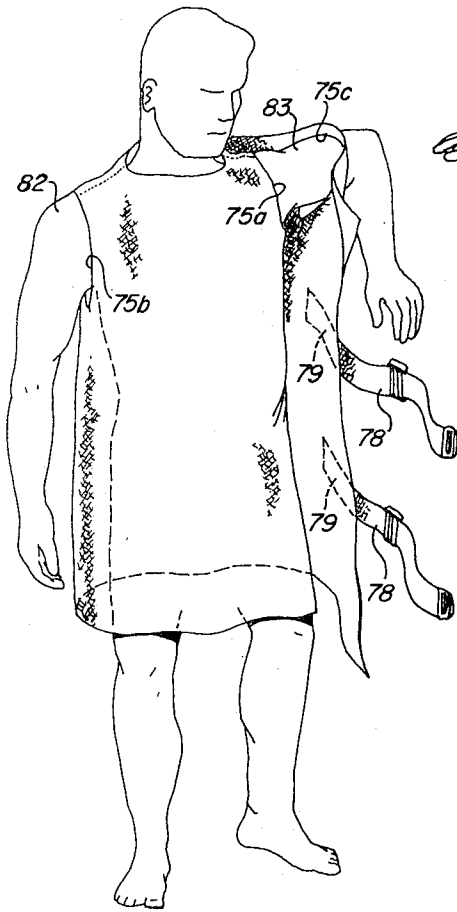


FIG. 8

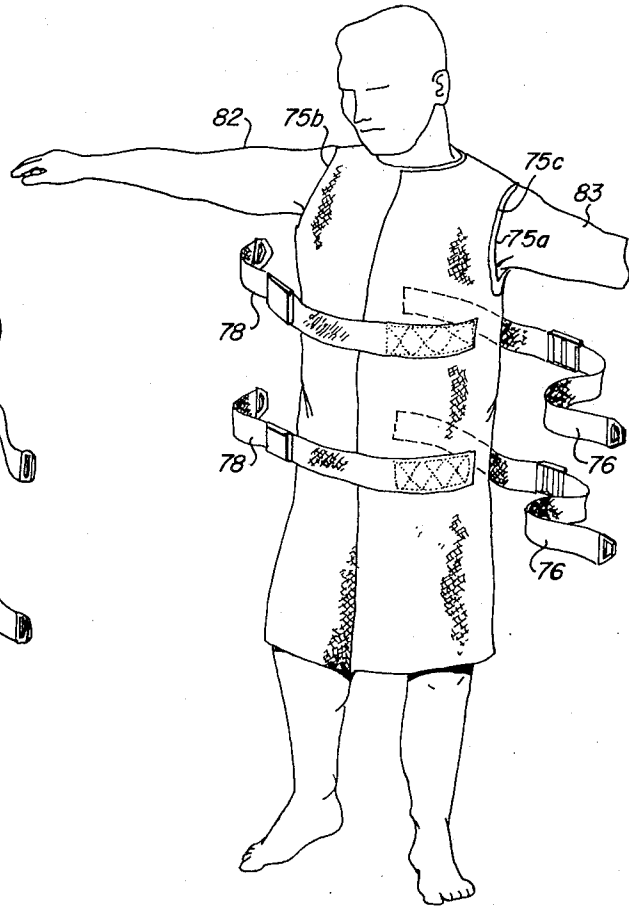


FIG. 9

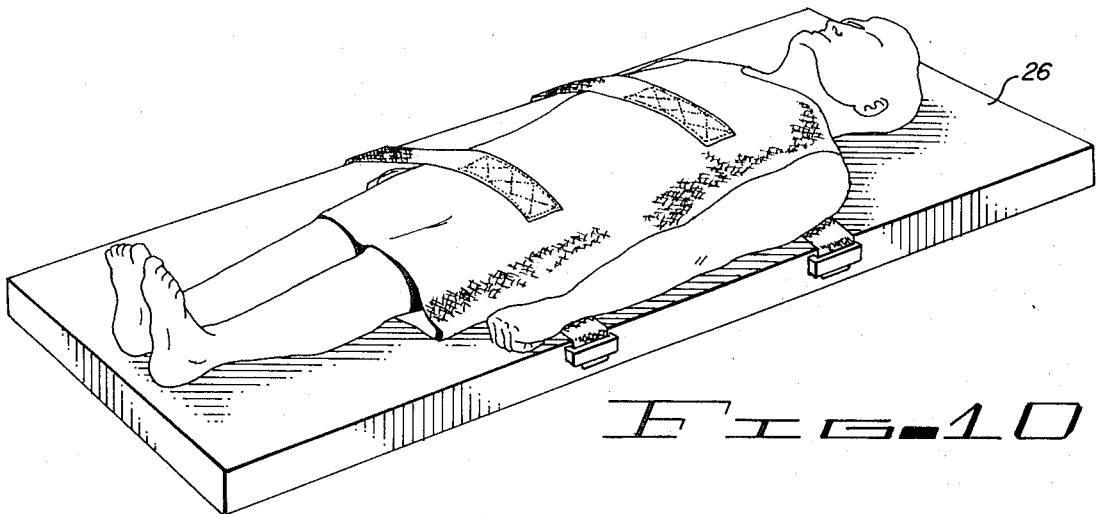


FIG. 10

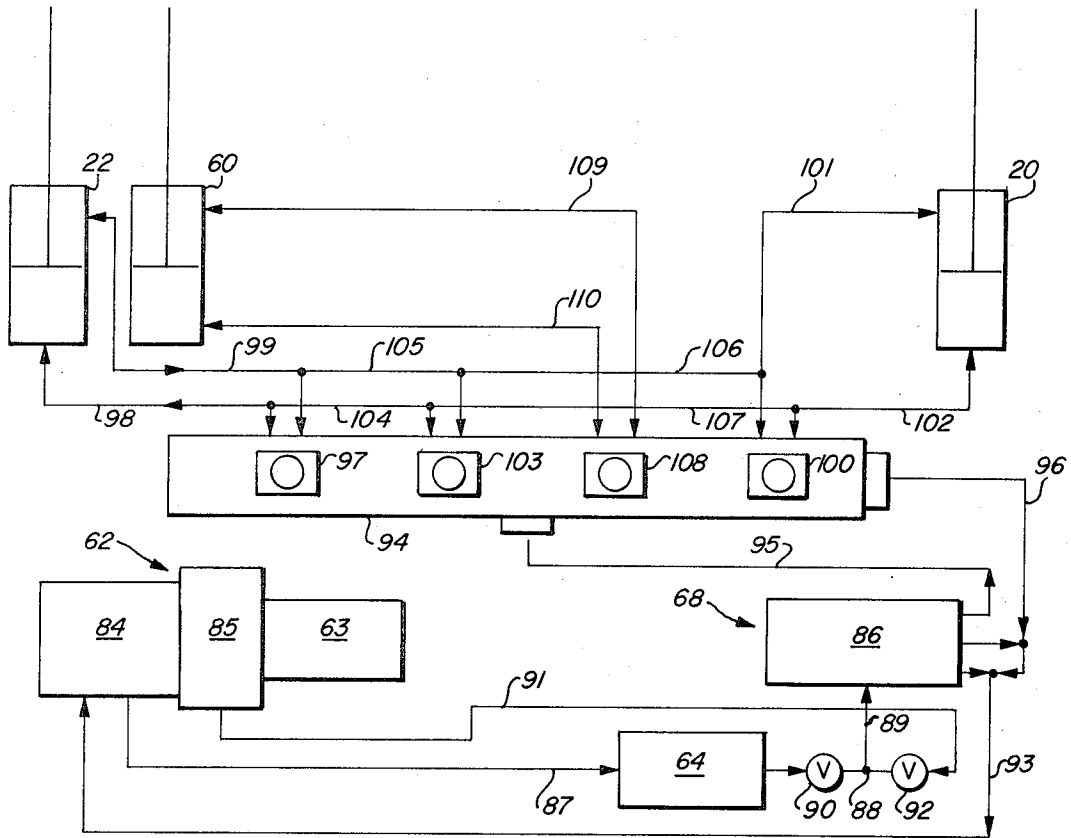
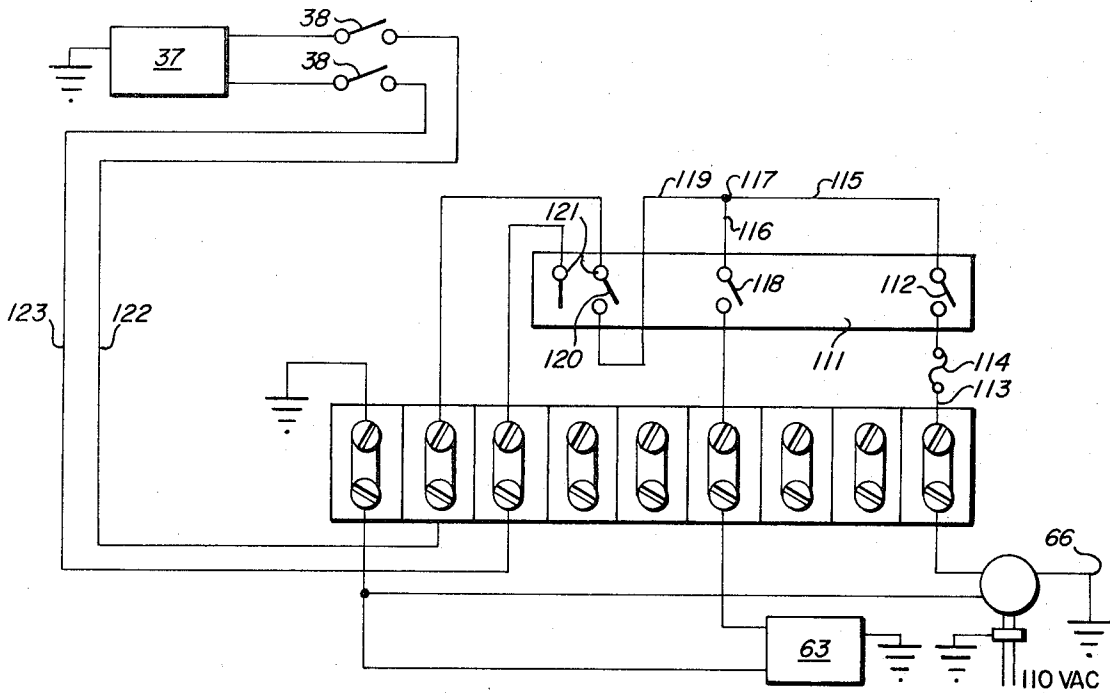


FIG. 11

FIG. 12



**MEDICAL EXAMINATION TABLE**

This application is a continuation-in-part application of the copending application of Hector Chapa, Ser. No. 274,635, filed July 24, 1972, and now abandoned for "Multi-Position Medical Table."

The present invention relates to medical examination tables and is concerned primarily with such a table intended for X-ray examinations and which includes means for securely affixing a patient thereto and also means for adjusting angular positions of the table on longitudinal and transverse axes.

**BACKGROUND OF THE INVENTION**

Under conditions now prevailing in the practice of medicine, it is often necessary to X-ray certain portions of a patient's body which are numerous and varied. While X-ray apparatus is available for X-raying a patient while either in a vertical or prone position, such apparatus is normally fixed or stationary, and in the instance of the patient being in a prone position, it is necessary that the patient be moved into various angular positions relative to the X-ray machine. Heretofore, various make-shift devices have been employed for this purpose.

The present invention is founded on the basic concept of providing an examination table to which a patient may be securely affixed in a desired position, with the height of the table being adjustable and the angular position of the table also adjustable on longitudinal and transverse axes.

**OBJECTS OF THE INVENTION**

With the foregoing conditions in mind, the present invention has in view the following objectives:

1. To provide a medical examination table comprising a movable base and a table proper which is vertically adjustable relative to the base and which comprises a main frame and an extensible section, with the main frame being angularly adjustable on longitudinal and transverse axes.

2. To provide, in a medical examination table of the type noted, hydraulic cylinder and piston assemblies for causing the foregoing adjustments.

3. To provide, in a medical examination table of the character aforesaid, hydraulic cylinders for elevating the main frame and casing angular adjustment on a transverse axis, which include holding valves for maintaining the table proper in a desired adjusted position in the event of power failure.

4. To provide, in a medical examination table of the kind described, an hydraulic cylinder for causing actuation on a longitudinal axis which includes a pair of holding valves to maintain the table proper in an angularly adjusted position in the event of power failure.

5. To provide, in a medical examination table of the type noted, mechanism for adjusting the extensible section relative to the main frame and which comprises a screw stem actuated by an electric motor.

6. To provide, in a medical examination table of the kind aforesaid, an hydraulic system which includes the hydraulic cylinders aforesaid and a power cylinder in which pressure in the hydraulic medium is generated by an electric motor.

7. To provide, in a medical examination table of the character aforesaid, a control console which includes levers for operating the valves which control the flow

of the hydraulic medium to the hydraulic cylinders and switch operating members for controlling the operation of the electric motors.

8. To provide, in a medical examination table of the type noted, a connection to the power cylinder for a hand pump to be used in the event of power failure.

9. To provide, in a medical examination table of the character aforesaid, means for securing a patient in fixed position on the extensible section and which means takes the form of a garment which is wrapped about a patient and which includes straps that are anchored to the extensible section.

10. To provide, in a medical examination table of the kind described, an extensible section of the table proper which is of a transparent material, such a plexiglass.

Various other more detailed objects and advantages of the invention, such as arise in connection with carrying out the above ideas in a practical embodiment, will, in part, become apparent and, in part, be hereafter stated as the description of the invention proceeds.

**SUMMARY OF THE INVENTION**

The foregoing objects are achieved by providing a medical examination table comprising a base of elongated U-shape presenting a horizontal leg at each end. This base is supported on castors which impart mobility thereto. Upstanding from each leg is an hydraulic cylinder. Associated with each cylinder is a piston which is pivotally secured at its upper end to an end piece of a rectangular main frame. An extensible section of plexiglass is mounted for longitudinal adjustment on the main frame. The main frame is supported at one end by a shaft received in a bearing which is pivotally secured to the piston at that end. The shaft is non-rotatable relative to the frame and extending therefrom and in driving relation thereto is an arm connected to a piston, the lower end portion of which is received in an hydraulic cylinder secured to the movable element of a two-part stabilizer, the upper end of which is connected to the shaft and the lower end to the base.

A screw stem is rotatably mounted in a longitudinally fixed position on the main frame and passes through a threaded boss on the extensible section. The screw stem is operated by an electric motor. An hydraulic system for the cylinders aforesaid includes a power cylinder in which pressure is built up on the hydraulic medium by an electric motor. A console is mounted on the base and includes levers for the hydraulic system and switches for the electric motor. A connection for a hand pump to the power cylinder is provided in case of power failure and a reel carrying a conductor is mounted on the base, with the conductor being extensible and having a plug at one end for connection to a source of power.

A wrap-around garment for the patient is provided and designed so that after the garment is wrapped about the patient a plurality of straps extend from each side of the patient. Each of these straps has a fitting at its free end which is detachably secured to an anchor on a side of the extensible section.

For a full and more complete understanding of the invention, reference may be had to the following description and the accompanying drawings wherein:

FIG. 1 is a perspective of a medical examination table designed in accordance with the precepts of this invention, with the patient-enveloping garment omitted;

FIG. 2 is a view in end elevation of the table;

FIG. 3 is a detail horizontal section through the piston and stabilizer at one end, being taken on the plane of the line 3—3 of FIG. 1;

FIG. 4 is a detail side elevation of the elevating and angular adjusting mechanism at one end, with a portion of the frame in section;

FIG. 5 is a detail perspective illustrating the elements of the elevating and tilting mechanism in exploded relation; this portion of the mechanism being that which is included in the circle designated 5 of FIG. 1;

FIG. 6 is a detailed perspective illustrating the connection of the upper end of a piston to the end of the frame remote from that at which the tilting mechanism is located; the area of this connection being indicated by the circle designated 6 of FIG. 1;

FIG. 7 is a plan view of the patient-enveloping garment in open position;

FIG. 8 is a perspective depicting the first step of applying the garment to the patient;

FIG. 9 is another perspective illustrating the garment as fully applied to the patient;

FIG. 10 is a perspective showing the patient as secured to the table;

FIG. 11 is a schematic view of the hydraulic system, and

FIG. 12 is a wiring diagram of the electric circuit.

#### DESCRIPTION OF THE PREFERRED EMBODIMENT

In describing the subject medical examination table, the table structure will first be described, then the garment, and finally the hydraulic system and electric circuit.

#### TABLE STRUCTURE

Referring now to the drawings wherein like reference characters denote corresponding elements throughout the several views, and first more particularly to FIG. 1, the medical examination table of this invention is shown as comprising a base identified in its entirety by the reference character 15. Base 15 is of an elongate U-shape presenting a back or side piece 16, a leg 17 at the end of the table which is hereinafter referred to as the front end, and a second leg 18 at the other or rear end. Secured to the underside of base 15 are castors 19 which are of a type which permits them to be locked in fixed positions of adjustment on vertical axes. Castors of this type are well known and available to the public, and, hence, details thereof are not herein illustrated or described.

Mounted on rear base leg 18 and extending vertically upwardly therefrom is a hydraulic cylinder 20 which receives a piston 21. Another hydraulic cylinder 22 is mounted on front leg 17 and receives a piston 23.

A table proper is referred to generally at 24 and comprises a main frame indicated in its entirety at 25 and an extensible section 26. Frame 25 is of rectangular shape presenting side members 27, a front end piece 28 and a rear end piece 29. Mounted on the outer face of each side member 27 is a channel-shaped guide 30.

Extensible section 26 is of a transparent material such as plexiglass, and includes a flange 31 at each side which overlies the guide 30 at that side. Any suitable anti-friction device such as rollers may be mounted on each guide 30 and flange 31. Secured to the outer faces

of flanges 31 are a plurality of strap anchors 32 for a purpose to be later described. Depending from the underface to extensible section 26 and at a location closely adjacent to side piece 27 is a boss 33 having a threaded longitudinal passage. A screw stem 34 is received in boss 33 and has its rear end anchored to end piece 29 as indicated at 35, while its front end passes through an opening in front end piece 28 where it is operatively connected to a driving element of a gear reduction unit 36 mounted on end piece 28. Gear reduction unit 36 is driven by an electric motor 37. A pair of limit switches, which are not illustrated in FIG. 1 but which are represented diagrammatically at 38 in FIG. 12, are mounted at opposite ends of screw stem 34 to disable motor 37 when boss 33 reaches a desired limit of longitudinal travel.

Referring now more particularly to FIG. 6, piston 21 is shown as carrying a U-shaped bracket 29 at its upper end. Bracket 39 presents a pair of plates 40 which are disposed on opposite sides of rear end piece 29, and are spaced apart a distance which provides for a required amount of longitudinal movement of frame 25 relative to piston 21 which is necessary to allow for tilting of frame 25 on a transverse axis. Each plate 40 is formed with a slot 41 which receives a stub shaft 42 that is secured to end piece 29.

At this point it is well to note that frame 25 may be tilted on a transverse axis to a comparatively small degree, with the maximum tilt being about 35°. This tilting action results in a variation of the longitudinal position of end piece 29 relative to piston 21, but is accommodated by the loose connection afforded by bracket 39.

Referring now to FIGS. 2, 3, 4 and 5, and first more particularly to FIG. 4, a channel bar 43 is secured to the underside of front end piece 28 in any preferred manner, as by welding. Channel bar 43 presents a lower flange 44 to which one end of a shaft 45 is non-rotatably secured, as by a bracket 49 (FIG. 5) and screw 47 which passes through an opening 48 in shaft 45.

The front end portion of shaft 45 is rotatable in a bearing 49 which is pivotally mounted on the upper end of piston 23 by a yoke 50. Bearing 49 has a front end face 51 on which is inscribed suitable calibrations which cooperate with a pointer 52 on a portion of shaft 45 which projects beyond end face 50 to indicate the angular position of table 24.

A stabilizer is indicated in its entirety at 53 and comprises a lower female channel member 54 which is secured to base leg 17 just behind piston 22 and a sliding male member 55 having a slot 56 at its upper end which receives shaft 45. At this point it is well to note that the pivotal mounting of bearing 49 in yoke 50 and slot 56 accommodates tilting movement of frame 25 on a transverse axis.

An arm 57 has one end drivably connected to shaft 45 in any preferred manner, such as by being welded thereto, and extends radially therefrom. Pivotal connection to the outer free end of arm 57 is a piston 58, with the pivotal connection being indicated at 59. Piston 58 is received in an hydraulic cylinder 60, the lower end of which is pivotally secured to stabilizer member 55 by the pivotal connection shown at 14. When an hydraulic medium under pressure is applied to cylinder 60, piston 58 is actuated to swing arm 57, and hence,



cause rotation of shaft 45 to tilt frame 25 on a longitudinal axis.

Mounted on the front end of base 15 is an hydraulic unit designated generally 61 which includes a power cylinder 62 and an electric motor 63. A connection 64 is shown for a hand pump for generating pressure in power cylinder 62 when electric power fails. Also secured to base leg 17 is a casing 65 which houses a reel for an extensible cord 66 having a plug 67 at its free end for connection to a source of power. A console 68 is mounted on base 16 and carries a plurality of levers 69 for controlling the flow of the hydraulic medium in the hydraulic system and switches 70 for the electric circuit.

### THE GARMENT

Referring now more particularly to FIGS. 7, 8, 9 and 10, a garment for use in securing a patient in position on table 24 will now be described. The garment comprises a piece 71 of heavy, durable fabric, such as denim or canvas, and is of the general trapezoidal shape depicted in FIG. 3. This shape presents a short top edge 72, a longer bottom edge 73 and side edges 74. Formed in piece 71 adjacent to edge 72 are three arm holes 75a, 75b and 75c. Secured to what is the outer face of piece 71 when the garment is in patient-enveloping position, are a plurality of straps 76. One end of each strap 76 is secured to piece 71 as by the stitching represented at 77. Another plurality of straps 78 have end portions 79 which are secured to the inner face of piece 71 along a side edge 74 as by stitching. Each of the straps 76 and 78 includes means for adjusting its effective length such as indicated at 80 and carries a fitting 81 at its free end which is adapted for cooperation with an anchor 32 on extensible section 26. It is notable that while two straps 76 and two straps 78 are herein illustrated and described, this number will probably be increased to four in actual practice of the invention. The illustration of only two of each set of straps is for the purpose of simplifying the illustration of the drawings.

The manner in which the garment is applied to the patient is illustrated in FIGS. 8 and 9. Thus, the right arm 82 of the patient is passed through the center arm hole 75b and the patient's left arm 83 through the arm hole 75c. That portion of the garment between the center and side edge adjacent arm hole 75a is wrapped about the back of the patient, whereupon the patient's arm is passed through arm hole 75a. This provides a double ply of the garment in front of the patient. In this position, straps 76 extend from the central portion of the patient's back and are directed to one side edge of table extension 26, while straps 78 are directed towards the other side edge of the table extension 26.

### THE HYDRAULIC SYSTEM

Referring now to FIG. 11, the hydraulic system will now be described. Power cylinder 62 is shown as including a tank 84 and a pump 85 which is driven by motor 63. A flow control unit 86 is included in console 68.

From tank 84 extends a conduit 87 to the connection 64 for a hand pump. At a point 88 in line 87 a conduit 89 extends to the flow control unit. A one-way check valve 90 is included in line 87 between pump connection 64 and point 88. This valve permits the flow of the hydraulic medium from tank 84 to the flow control

unit, but prevents flow in a return direction. Another conduit 91 extends from pump 85 and is connected to point 88 with another one-way check valve 92 included therein. A return flow conduit 93 extends from unit 86 to tank 84.

A valve bank is designated generally 94. It is connected to the flow control unit 86 by a conduit 95. Hydraulic medium from valve bank 94 is returned to unit 86 by line 96. A valve for front cylinder 22 is shown at 97 and is connected thereto by liner 98 and 99. When this valve is open or in effective position, cylinder 22 is activated to the exclusion of rear cylinder 20. A valve 100 is connected to rear cylinder 20 by lines 101 and 102. Valve 100 operates rear cylinder 20 to the exclusion of front cylinder 22. Another valve 103 is provided for causing simultaneous operation of both cylinders 20 and 22. Valve 103 is connected to line 98 by line 104 and to line 99 by line 105. It is also connected to line 101 by line 106 and to line 102 by line 107. A so-called tilting valve is indicated at 108 and is connected by lines 109 and 110 to cylinder 60. It will be understood that levers 69 in console 68 operate the valves in bank 94. Thus, there is one lever for valve 97, another for valve 100, another for valve 103 and the fourth for valve 108.

While they are not illustrated in the drawings, it is noted that each of the cylinders 20 and 22 is provided with a so-called safety valve at its lower end to prevent the respective piston from falling in the event of power failure. It is believed that such safety valves are so well known that it is not necessary to illustrate or describe them in detail. Moreover, tilting cylinder 60 is provided with such a safety valve at each end. Thus, with the table in any angular position, should power fail, it will remain in such position.

### THE ELECTRIC CIRCUIT

A bank of switches is represented at 111. Included in this bank is a main control switch 112 which is closed to render any of the other switches effective. This switch is effective on line 113 which includes a fuse 114 to control the flow of electric current from the source through cable 66. From switch 112 extends a line 115 to which another line 116 is connected at point 117. Line 116 includes a switch 118 which controls the flow of current to pump motor 63. From point 117 a line 119 extends to a pole 120 of a double-throw switch. This double-throw switch includes poles 121 which are connected by lines 122 and 123 to gear box motor 37. Limit switches 38 are included in these lines 122 and 123. It is evident that when the double-throw switch is in one position, motor 37 is driven in one direction to rotate screw stem 34 in the corresponding direction, and when in its other effective position, motor 37 and screw stem 34 are rotated in the reverse direction.

### OPERATION

While the manner of use and mode of operation of the above described medical examination table are believed to be obvious from the illustration of the drawings and description of parts set forth above, they may be briefly described as follows.

Garment 71 is first applied to the patient in the wrapped-around position illustrated, the patient positioned on extensible section 26 and fittings 81 secured to strap anchors 32. Castors 19 are released from their locked position and base 15 rolled to the desired posi-

tion relative to the X-ray machine and plug 67 is connected to a suitable outlet. The proper lever 69 is now availed of to determine which of the cylinder 20 or 22 is to be raised or lowered or whether they are to be operated simultaneously. Thus, the table 24 is brought to a desired vertical position relative to the X-ray machine. The double-throw switch which controls the motor 37 is then operated to achieve a desired longitudinal adjustment of extensible table section 26. Should it be desired to tilt the table on its longitudinal axis, the appropriate lever 29 is utilized to render the valve 108 effective to cause cylinder 60 to rotate the table on shaft 45.

While a preferred specific embodiment is herein disclosed, it is to be clearly understood that the invention is not to be limited to the exact constructions, mechanisms and materials illustrated and described because various modifications of these details may be provided in putting the invention into practice.

What is claimed is:

1. In a medical table for X-ray examinations:
  - a. a mobile base;
  - b. a front hydraulic cylinder upstanding from said base and having a piston projecting upwardly therefrom;
  - c. a rear hydraulic cylinder upstanding from said base and having a piston upstanding therefrom;
  - d. a rectangular table frame presenting a front end piece, a rear end piece and side members;
  - e. a loose pivotal connection between said rear end piece and the piston of said rear cylinder and located centrally thereof;
  - f. a shaft non-rotatably connected to said front end piece centrally thereof;
  - g. a bearing pivotally mounted on the upper end of the piston of said front hydraulic cylinder on a transverse axis, said bearing receiving said shaft;
  - h. an extensible stabilizer comprising a female member secured to said base and a male member having an opening receiving said shaft;
  - i. an arm extending radially from said shaft;
  - j. a piston having its upper end pivotally connected to said arm;
  - k. an hydraulic cylinder receiving said last mentioned piston and having its lower end pivotally connected to the male member of said stabilizer;
  - l. a transparent extensible table section mounted for longitudinal sliding movement on said frame;
  - m. means for adjusting said extensible section relative to said frame and holding it in an adjusted position, and
  - n. means for securing a patient in position on said extensible section.
2. The medical examination table of claim 1 in which

the means for adjusting the extensible section relative to the frame comprises a boss depending from said extensible section and having a threaded opening, together with a screw stem threadedly received in said opening and having its opposite ends fixedly secured to said frame, and an electric motor for rotating said screw stem.

3. The medical examination table of claim 1 in which the bearing has an end face with calibrations inscribed thereon, and in which the shaft projects beyond said end face and carries a pointer cooperating with said calibrations.

4. The medical examination table of claim 1 in which said hydraulic cylinders are included in a hydraulic system which also includes a power unit mounted on said base, and including a tank, a pump and an electric motor for driving said pump.

5. The medical examination table of claim 4 in which the tank has a connection for a hand pump to be used in case of power failure.

6. The medical examination table of claim 4 in which the electric motors are included in an electric circuit, together with a console on said base in which is mounted electric switches for said electric circuit and operating levers for said hydraulic system.

7. The medical examination table of claim 1 in which the base is of elongate U-shape presenting front and rear legs, with said front hydraulic cylinder mounted on said front leg and the rear hydraulic cylinder on said rear leg.

8. The medical examination table of claim 1 in which the means for securing a patient in position on the extensible table section comprises a garment that is wrapped about the patient and includes two sets of straps which, when the garment is wrapped about the patient, extend from opposite sides of the garment, a fitting on the end of each of said straps and a plurality of strap anchors on said extensible section cooperating with said fittings.

9. The medical examination table of claim 8 in which the garment has upper and side edges and is formed with three arm hole openings adjacent to said upper edge with one of said openings being located centrally of the garment and each of the other openings located adjacent to a side edge, and one set of straps has end portions secured to the garment centrally thereof and the other set of straps has end portions secured to the garment adjacent to a side edge thereof.

10. The medical examination table of claim 9 in which the extensible table section is of plexiglass and has side flanges overlying the side members of the frame, and the strap anchors are mounted on the exterior faces of said flanges.

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