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VERTICAL RADIOGRAPHIC UNIT

Filed Oct. 15, 1962

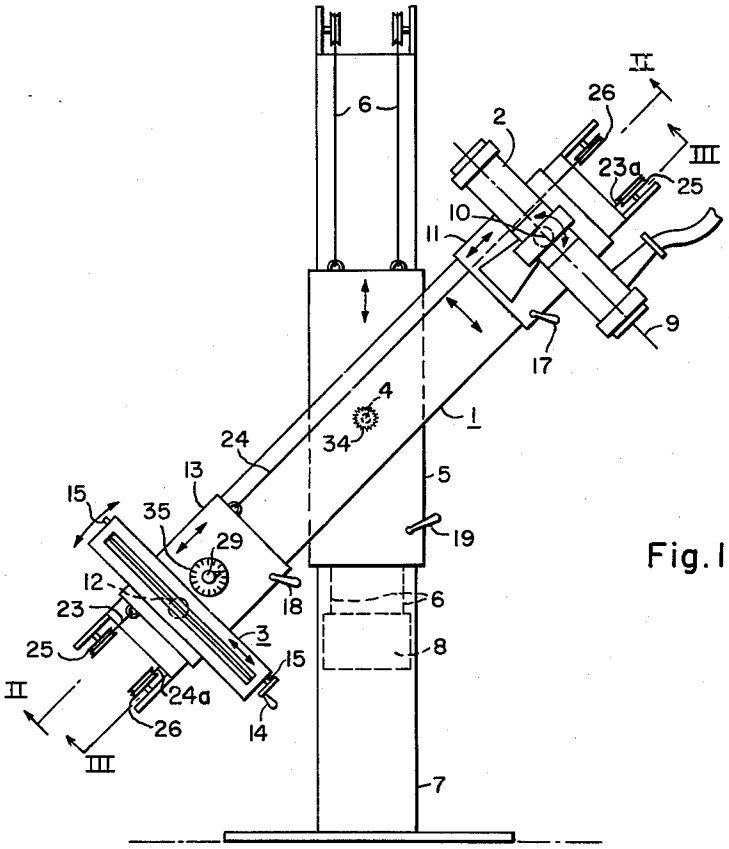


Fig. 1.

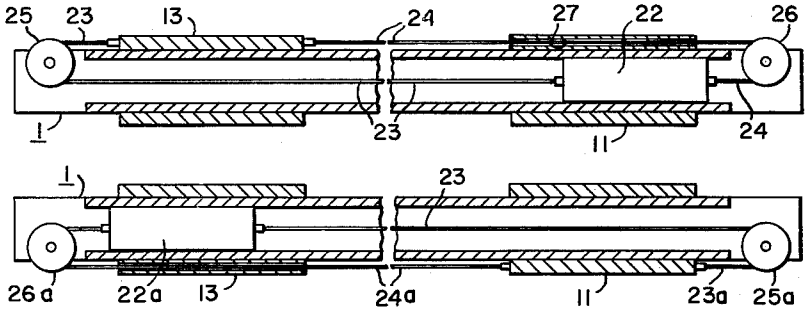


Fig. 2.

Fig. 3.

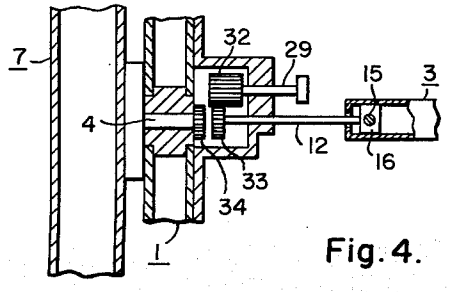


Fig. 4.

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VERTICAL RADIOGRAPHIC UNIT

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The present invention relates to X-ray apparatus and more particularly to a vertical radiographic unit.

A prime object of the present invention is to provide an improved vertical radiographic unit of the type comprising an X-ray tube and a film cassette holder movable to different angular and spaced-apart positions on a rockable arm which is pivotally mounted at its center on a vertical carriage which is movable to different vertical positions along a vertical column.

It is another object of the present invention to provide an improved vertical radiographic unit which greatly facilitates use of such unit in the numerous radiographic techniques of which such types of unit can be employed.

Other objects and advantages of the invention will become obvious from the following description when taken in connection with the accompanying drawing, in which:

FIGURE 1 is a front elevational view of the vertical radiographic unit embodying the invention;

FIGS. 2 and 3 are section views taken along the lines II—II and III—III, respectively, in FIG. 1 showing details of the X-ray tube and film cassette holder counterbalancing arrangements embodied in the improved unit; and

FIG. 4 is cross-sectional showing of an orientation-locking system for the film cassette holder embodied in the improved unit.

Description

Referring to FIG. 1 the improved radiographic unit of the present invention comprises in general, a rockable arm **1** which carries an X-ray tube **2** and a film cassette holder **3**, and which is pivotally supported via a shaft **4** on a vertical carriage **5** which in turn is supported via counterbalance cables **6** on a vertical column **7** which, as shown in FIG. 1, is floor-mounted, but which may be otherwise mounted as on such as floor and ceiling tracks, etc. for mobility of the unit. Full vertical counterbalancing of the equipment supported by the vertical carriage **5** is effected by counter-weight means **8** within the column **7**, via the cables **6**. The X-ray tube **2** is suitably mounted for adjustable rotary movement about mutually-perpendicular axes **9** and **10** on an X-ray tube carriage **11** suitably mounted for movement along the arm **1** in a direction perpendicular to each of the axes **9** and **10**. The film cassette holder **3** is mounted via a shaft **12** on a cassette holder carriage **13** suitably mounted for movement to selected positions along the arm **1**. The cassette holder **3** and shaft **12** are turnable in unison about the axis of such shaft which extends perpendicular to the direction of travel of the carriage **13**. Sidewise movement of the cassette holder **3** perpendicular to the axis of shaft **12** and relative thereto may be effected via a crank handle **14** and an attached screw member **15** which extends in screw-threaded engagement with an internally-threaded member **16** secured to the outer end of the shaft **12**. Locking of the X-ray tube carriage **11** in a selected position along the arm **1** can be effected by a lock tab **17** which effectuates a locking mechanism or brake of suitable type, while similar locks for the cassette holder carriage and the vertical carriage may be effectuated by lock tabs **18** and **19**, respectively.

In accord with the improvements of the present invention, the X-ray tube carriage **11** and the cassette holder carriage **13** are independently movable along the arm **1**. This affords a greater degree of freedom in adjustment of the film cassette holder **3** relative to the X-ray tube **2** than heretofore possible which results in a significant reduction in set-up time in any of the numerous techniques which may be employed with the unit in the various angular and vertical positions of the arm **1**, the relative angular positions of the X-ray tube **2** and cassette holder **3**, as well as the different relative separation distances of the latter.

Referring to FIGS. 1, 2 and 3, to permit such independent movement of the X-ray tube carriage **11** and the film cassette carriage **13** without disturbing the balance of the arm **1**, each carriage, including its supported load, is counterbalanced relative to shaft **4** by a respective counterweight **22** connected at its opposite ends to respective oppositely-extending cables **23** and **24** extending through the arm **1**, passing around respective pulleys **25** and **26** rotatably mounted at opposite ends of the arm, thence to respective fixed connections at opposite ends of the particular carriage. The cable **24** for a particular carriage **11** or **13**, as the case may be, may pass freely through an opening **27** extending lengthwise through the other carriage. As the arm **1** is viewed in FIG. 1, the two independently-movable counterweights **22** (hidden from view in FIG. 1) will travel along respective parallel paths along opposite edges of such arm and at opposite sides of the shaft **4** which pivotally supports arm **1**.

As an aid in distinguishing elements **22** to **26** relating to carriage **11** from those relating to carriage **13**, in the drawings, the numerals **22** to **26** relating to carriage **11** are given a subscript "*a*" in FIGS. 1 and 3.

Referring to FIGS. 1 and 4, in accord with another feature of the present invention, the film cassette holder **3** may be locked to a particular rotary position about the axis of shaft **12** by depression of a cassette-orientation-lock-control plunger shaft **29** mounted on the carriage **13**, when the carriage is moved to the center of the arm **1**, with the shaft **12** on which cassette holder **3** is mounted, brought into alignment with the shaft **4** on which the arm **1** is mounted, as shown in FIG. 4. This feature enables the cassette to be brought into contact with the patient at an area to be radiographed, and to be locked in such position while the arm **1** is moved to different angular positions about the shaft **1** to orient the X-ray tube **2** for a series of radiographs of the selected region of the patient from the several angles without requiring corresponding movements of the patient. This series of radiographs taken from various angles being a common technique, for example, in X-ray examination of a patient's head where the view may be obscured by the skull and an adequate, complete or true picturization can be obtained only by shots taken from selected angular positions.

Such cassette-holder-orientation-locking feature is obtained, FIG. 4, in the aforedescribed center position when plunger shaft **29** is depressed, by an elongated gear element **32** which constantly engages a gear element **33** secured to the end of the shaft **12** carrying the cassette holder **3** and is made to also engage a gear element **34** secured to the end of shaft **4** by such depression. In the position in which the parts are shown in FIG. 4, the non-locked position, rotation of the cassete holder **3** about the axis of shaft **12** relative to the carriage **13** may be effected by turning the plunger shaft **29**, which turns the cassette holder **3** via gear elements **32** and **33**, shaft **12**, and member **16** which is in transverse slidable engagement with inner surfaces of cassette holder **3**. Indication of the selected rotary position is given by a dial **35** on the

carriage **13** and encircling the outer end of the plunger shaft **29**. When plunger shaft **29** is depressed, a selected angular position of the cassette holder **3** relative to an immobile patient is held automatically during angular movement of the arm **1** by locking action between the non-rotary gear element **34** and the gear element **33** as bridged by the gear element **32**.

While the foregoing has described the invention in connection with an exemplification embodying certain details which may be preferred, it will be understood that the invention as defined by the appended claims, embraces modifications and/or details which will become readily apparent to those versed in the art to which this invention pertains.

We claim as our invention:

1. In a vertical radiographic unit, the combination of an arm rockable about a horizontal pivot axis, an X-ray tube means on said arm movable therealong, a film cassette holder turnable about an orientation axis perpendicular to the direction of extension of said arm and movable therealong to a position in which said orientation axis coincides with said pivot axis, and means operable to maintain said film cassette holder in a selected angular attitude relative to a fixed plane containing said orientation axis while said holder is in said position and said arm is rocked about said pivot axis.

2. In a vertical radiographic unit comprising a vertically-movable carriage, an elongated arm, support means on said vertically-movable carriage pivotally supporting said arm substantially equidistant its ends for rockable

movement about a pivot axis defined by such support means, an X-ray-tube-carrying carriage on said arm movable therealong, a film-cassette-holder carriage on said arm movable therealong relative to said X-ray-tube-carrying carriage, a substantially flat film cassette holder mounted on said film-cassette-holder carriage and turnable to different angular positions about an orientation axis perpendicular to the direction of extension of said arm, the foregoing being constructed and arranged to permit said pivot axis and orientation axis to coincide when said film-cassette-holder carriage occupies a mid position on said arm, and means to maintain said film cassette holder in a selected angular position relative to a fixed plane containing the coincident axes, while said arm is rocked about such axes.

3. The combination as set forth in claim **2**, further including means balancing said arm about said pivot axis in all independent longitudinal position of the X-ray-tube-carrying and film-cassette-holder carriages.

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